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FIRST QUARTER
GROUNDWATER MONITORING REPORT

Mccall Oil & Chemical Corporation
and
Great Western Chemical Company
NW Front Avenue Properties
Portland, Oregon

Prepared for

McCall Oil & Chemical Corporation
and
Great Western Chemical Company

October 21, 1994

Prepared by
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Project 0235-007.09

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TABLES AND ILLUSTRATIONS

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SUMMARY

Findings

- The site is underlain by dredge spoils, up to 22 feet thick, which consist of poorly graded sands with some silt. The dredge spoils are immediately underlain by finer grained fluvial-lacustrine sediments comprised of silty clay. The lower portion of the dredge spoils are saturated. The saturated thickness at the time of measurement is less than 10 feet.

- The groundwater flow direction in the shallow dredge spoils varies across the site; consistently towards the Willamette River.

- Groundwater beneath the site is not used for drinking water. Groundwater discharges to the Willamette River.

- The results of soil and groundwater sampling indicate that petroleum hydrocarbons are not impacting groundwater at the site. An unspecified heavier petroleum hydrocarbon was detected in one shallow soil sample at a concentration that does not represent a threat to groundwater, human health, or the environment.

- Chlorinated volatile organic compounds (VOC) were detected in duplicate groundwater samples from one groundwater monitoring well. The VOC detected are 1,1-dichloroethene (DCE), 1,1,1-trichloroethane (TCA), trichloroethene (TCE), and tetrachloroethene (TCE).

- The monitoring well where the VOC were detected is over 800 feet from the Willamette River. The concentrations of VOC detected are less than the state of Oregon freshwater acute or chronic water quality criteria and VOC at the concentrations detected would not have an adverse effect on the Willamette River.

- The VOC detected are not representative of operations at the facility. Great Western Chemical Corporation (GWCC), which operates in the area where the VOC were detected, formulates numerous compounds, many of which are handled in much greater volumes than those detected. If a release had occurred from GWCC, these other compounds, which are handled in greater volumes and more frequently, should have been detected in groundwater samples. They were not.

Recommendations

- Expand the groundwater sampling program during the next three quarters of assessment to include sampling for chlorinated VOC in the other three groundwater monitoring wells being sampled.

1 INTRODUCTION

1.1 Purpose

McCall Oil and Great Western Chemical Company (McCall/GWCC) contracted with EMCON Northwest, Inc. (EMCON), to complete a Preliminary Assessment (PA) report for their properties in Portland, Oregon (see Figure 1). The PA was submitted to the Oregon Department of Environmental Quality (DEQ) on April 5, 1994. The PA reviewed and evaluated information from employee interviews, a review of file information, an assessment of potentially impacted media, and information obtained during a site tour.

After reviewing the PA, the DEQ requested in its letter dated June 7, 1994, that additional groundwater assessment work be done on the site to assess the potential for groundwater discharge to impact the Willamette River. A groundwater assessment workplan (workplan) was submitted to the DEQ on August 2, 1994. Approval of the workplan was received from the DEQ in a letter dated August 9, 1994. Modifications to the workplan agreed to in telephone conversations between EMCON and DEQ's project manager are summarized in EMCON's letter dated August 31, 1994. This report describes the results of the first quarter of groundwater assessment, as described in the workplan. This report should be reviewed in conjunction with the PA report, workplan, and previously referenced correspondence.

1.2 Background

In September 1993, the DEQ requested that MCCall/GWCC conduct a preliminary assessment of its marine oil terminal and chemical distribution facilities in northwest Portland, as part of the DEQ's ongoing investigation of petroleum product releases in the Willbridge industrial area of northwest Portland. Area-wide groundwater impacts resulting from operations at several bulk petroleum terminals and other industrial sites in Portland have been documented in previous reports (Hart Crowser, 1993; SEACOR, 1993a,b).

1.3 Scope of Work

The scope of work for the additional groundwater assessment completed in September 1994 by EMCON consisted of:

- Drilling and installing three monitoring wells
- Collecting two soil samples from each monitoring well boring
- Developing each monitoring well
- Surveying the location and reference point elevations at each monitoring well
- Collecting groundwater samples from each monitoring well
- Analyzing all soil samples for total petroleum hydrocarbons (TPH)
- Analyzing all groundwater samples for TPH and BTEX (benzene, toluene, ethyl benzene, and xylene)
- Analyzing a groundwater sample from one monitoring well for volatile organic compounds (VOCs)
- Performing hydraulic tests on the three new wells
- Evaluating analytical results and aquifer test results
- Preparing this report

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2 FIELD PROCEDURES

2.1 Well Drilling and Soil Sampling

In September 1994, three borings (EX-1, EX-2, and EX-3) were drilled (see Figure 2) to further evaluate groundwater and soil conditions on the site. Monitoring wells were completed at depths ranging from 25.0 to 26.0 feet below ground surface (bgs) in the uppermost water-bearing zone. A geologic log and well construction diagram for each boring is included in Appendix A.

Geotech Explorations, Inc., of Tualatin, Oregon, a state-licensed well driller, drilled each well boring using an 10-inch (outside diameter) hollow-stem auger. The upper 5 feet of each boring were advanced by hand to minimize the potential of damaging a utility not identified by the utility locators. During drilling, soil samples were collected continuously, using split-spoon samplers. The lithology of each sample was described on the field boring log.

Soil samples were collected from each boring at 5 feet bgs and at 1 foot above the groundwater table and analyzed for TPH by Columbia Analytical Services (CAS) in Kelso, Washington. Details on sample intervals are included in the geologic logs (Appendix A) and in Table 1. Soil samples collected for chemical analysis were placed in clean, laboratory-supplied jars, stored in an iced cooler, and shipped to CAS with chain-of-custody documentation. Copies of the chain-of-custody documentation are included in Appendix B.

Part of each soil sample was also collected for head space analysis in the field, using a flame ionization detector (FID). Headspace samples were placed in clean jars and covered with aluminum foil; the lid was then screwed down. After temperature of the sample was allowed to stabilize at approximately room temperature, the lid was removed, a small hole was punched through the foil, the FID sensor was inserted, and the FID reading was recorded. FID data are shown on the boring logs in Appendix A.

2.2 Monitoring Well Construction

Each monitoring wells was constructed of 2-inch-diameter, flush-threaded schedule 40 polyvinyl chloride (PVC) well casing and 10 feet of 0.010-inch machine-slotted screen. Each well screen was placed to intersect the groundwater table observed during drilling. A sand pack of washed and graded 20 x 40 Colorado silica sand was installed around the screened interval to reduce the concentration of suspended sediment in water entering the well. Geotech surged the wells during placement of the sand pack, before placing the bentonite seal, to ensure stabilization of the sand pack and also to facilitate well development. Bentonite chips were placed in the borehole above the sand pack to form a seal, and a concrete surface seal with flush-mount steel security casings was installed. Well construction details are given in Table 2 and on the boring logs (Appendix A).

2.3 Monitoring Well Development

Each monitoring well was developed by alternately surging with a new disposable bailer and purging with a peristaltic pump equipped with new PVC tubing. Development was discontinued when the field parameters (pH, specific conductance, and temperature) was stable and the purge water was relatively clear. A minimum of 15 well volumes were removed from each well. Well-development details are presented in Table 3.

2.4 Groundwater Sampling

Groundwater samples were collected from four monitoring wells (EX-1, -2, -3, and -4) on September 8, 1994 (Figure 2). At least 3 well volumes were purged from each well with a peristaltic pump prior to sample collection. The pH, specific conductance, and temperature of the purge water was measured after each well volume was removed, to check for stabilization of water quality parameters. Well purging and field parameters are summarized in Table 4.

Once field parameters stabilized, a groundwater sample was collected from each well using a disposable polyethylene bailer. Disposable bottom-emptying devices were used to fill the volatile organic analyte (VOA) vials. Groundwater samples were placed directly into laboratory-supplied glass jars and VOA vials and stored in an iced cooler until delivered to the lab, with chain-of-custody documentation. Copies of the chain-of-custody documentation and field sample data sheets are given in Appendices B and C, respectively.

Groundwater samples were submitted to CAS for analysis of TPH (USEPA Method 8015M) and BTEX (USEPA Method 8020). Duplicate samples for VOC analysis by USEPA Method 8240 were collected from EX-1, in addition to the TPH and BTEX samples. Groundwater quality-control samples were collected from EX-1 and from EX-2, blind-labeled, and submitted to CAS with the others.

2.5 Permeability Testing

Slug tests were conducted in EX-1, -2, and -3 to estimate the hydraulic properties of the aquifers. Before the tests, the depth-to-water and the total depth of each well were measured with an electric wireline sounder. A pressure transducer and an electric datalogger were used to measure water-level changes during the slug tests and to record the data.

Because of workplan specified well installation techniques, and the nature of the uppermost water-bearing zone, the height of water standing in the wells was low, ranging from 6.03 feet to 8.73 feet. This precluded use of a 10-foot slug and a 5-foot slug was used. Additionally, since the water table intersected the screened interval in every well, falling- head tests were not performed (the effect recorded would have been that of the sand pack, not of the native formation).

Rising-head tests were performed on each well by lowering the slug into the well with new, clean polyester rope, allowing the water in the well to return to a static level, then removing the slug simultaneously while starting the datalogger. Slug tests were considered complete when water levels were 90 percent recovered.

2.6 Decontamination

All nondisposable sampling and slug test equipment was decontaminated between each sample location by the following procedure: dilute nonphosphatic detergent wash; distilled-water rinse; dilute methanol rinse; second distilled-water rinse; and sample rinse, in sequence. All downhole drilling equipment was decontaminated by high-pressure hot water washing.

Soil cuttings and development water were placed into steel drums, which were labeled and left on site, pending laboratory analysis.

2.7 Surveying

The location and elevation of each well and the river staff gauge were surveyed by Westlake Consultants, Inc., of Portland. The wells and staff gauge were located relative to the State Plane Coordinate System. The ground surface and top of casing elevations were surveyed relative to mean sea level (MSL).

3 ENVIRONMENTAL SETTING

3.1 Geology

The site is underlain by dredge spoils, predominantly poorly graded sands with varying amounts of silt. The dredge spoils are relatively homogenous, with some silt and clay lenses, and overlie the original surface of lake bottom sediments, marsh silts, and silty clays. Samples collected during the on-site drilling revealed the dredge spoils to be approximately 22 feet thick, with native interbedded silts and sands to about 25.5 feet. Previous drilling on site has shown that this layer is underlain by an approximately 5-foot-thick layer of silt and clayey silt.

3.2 Hydrogeology

Groundwater elevations ranged from 13.7 feet MSL to 20.73 feet MSL on September 29, 1994 (Figure 3). The direction of shallow groundwater flow beneath the site in September 1994 varied from northwest to northeast, depending on proximity to the Willamette River. The inland gradient was 0.02 foot per foot (ft/ft) which steepened to a low of 0.11 ft/ft and a high of 0.33 ft/ft as it neared the river's edge. The river, reflecting low tide, was 0.98 feet below sea level.

Slug test data were analyzed by Hvorslev and Schmid's method as described in Woodward-Clyde (1977, pp. 94-97), and by the Bouwer and Rice (Bouwer, 1989) method. Data and calculations are included in Appendix D.

Slug tests in two of the three wells tested were judged to be invalid because of the rapidity of recovery. Both EX-1 and EX-3 were screened in a poorly graded sand or silty sand (SP-SM), and 100 percent recovery was achieved in less than 1 minute, indicating a horizontal conductivity of greater than 10^{-2} cm/sec, the typical range for a clean sand (Freeze and Cherry, 1979). The quick response is thought to reflect solely the sand pack installed around the well screen.

EX-2 was screened through a zone of interbedded SP-SM and silt, so the recovery was a little slower, and more amenable to slug test analyses. Bouwer and Rice analysis resulted in a horizontal conductivity of 2.6×10^{-4} cm/sec when calculated with the assumption that the well was fully penetrating the aquifer, and a Hvorslev analysis resulted in a horizontal conductivity of 3.3×10^{-4} cm/sec, which are both reasonable conductivities for a silty sand (Freeze and Cherry, 1979).

Estimated groundwater velocities beneath the site vary based on lithology. Velocities in the clean sand range from 2.8 ft/day inland to 47 ft/day nearer the river, assuming a porosity of 0.2 and a horizontal conductivity of 10^{-2} cm/sec. Velocities in the interbedded silt and sand, like that in EX-2 near the river's edge, range from 0.69 ft/day to 0.86 ft/day, assuming a porosity of 0.35, maximum and minimum horizontal conductivities as calculated for EX-2, and a gradient of 0.33 ft/ft calculated for the river edge proximal to EX-2.

4 SOIL AND GROUNDWATER ANALYSIS

4.1 Soil

Analytical results for soil samples collected during the well drilling are presented in Table 5. Copies of the original laboratory reports and chain-of-custody records are in Appendix B.

Shallow soil samples collected at 5 feet bgs in each boring were analyzed for TPH by USEPA Method 3550/8015M. EX-1 and EX-2 had TPH concentrations of 321 milligrams per kilogram (mg/kg) and 55 mg/kg, respectively, in the C_{20} to C_{30} range (unspecified heavy petroleum). The laboratory reports that the chromatogram for these samples showed a bump without a distinct peak that may be within the range of several commercially available hydraulic oils. No TPH concentrations were detected in EX-3.

TPH was not detected in deeper soil samples collected 1 foot above the water table, or at approximately 15 to 16 feet bgs.

4.2 Groundwater

Groundwater samples collected from four monitoring wells were analyzed for TPH (USEPA Method 3510/8015M), BTEX (USEPA Method 5030/8020). The water sample collected from EX-1 was analyzed for VOCs (USEPA Method 8240), in addition to analyses performed on samples from the other wells. Analytical results are shown in Table 6. Copies of the original laboratory reports and chain-of-custody records are in Appendix B.

TPH was not detected in groundwater samples, except for the sample from EX-1, which had a TPH concentration of 266 μg/L in the C_{20} to C_{30} range, slightly above the method reporting limit. The laboratory reported that the chromatogram for the sample resembled that described earlier in Section 4.1 (i.e., it is in the hydraulic oil range). BTEX was not detected in any groundwater sample.

Two samples from EX-1 were analyzed for VOC using USEPA Method 8240. Four compounds were detected. 1,1-Dichloroethene (DCE) was detected at 7 μg/L 2 μg/L higher than the method reporting limit. 1,1,1-Trichloroethane (TCA) was detected at

180 μg/L in one sample and at 170 μg/L in the other. Trichloroethene (TCE) was detected in one sample at 160 μg/L and at 150 μg/L in the other. Tetrachloroethene (PCE) was detected at 650 μg/L in one sample and at 620 μg/L in the other. The PCE results were from a sample that was diluted five times.

4.3 Data Validation

Soil and groundwater analytical data were examined for consistency, transmittal errors, laboratory protocol, and laboratory quality assurance and quality control. The data presented in this report were judged acceptable for use. A data validation memo is included in Appendix B.

4.4 Evaluation of Groundwater VOC Detections

The site is located in the Willamette Greenway and is zoned for heavy industrial use. Adjacent properties are also zoned for heavy industrial use. Land use is not expected to change for the foreseeable future.

Recent groundwater monitoring in the shallow water-bearing zone at the site has detected 1,1-dichloroethene (1,1-DCE), 1,1,1-trichloroethane (1,1,1-TCA), trichloroethene (TCE), and tetrachloroethene (PCE) at 7 micrograms per liter (μg/L), 180 μg/L, 160 μg/L, and 650 μg/L, respectively. The concentrations of TCE and PCE exceed their USEPA-established maximum contaminant levels of 5 μg/L (USEPA, 1994) (see Table 7). However, groundwater that flows beneath the site is not used for domestic purposes and is not expected to be used for domestic purposes in the future. The geologic and hydrogeologic evidence indicates that the migration path of groundwater beneath the site varies from the northwest to the northeast. Groundwater discharges to the Willamette River. Since the site borders the river, there is no opportunity for downgradient use of groundwater for domestic purposes.

The concentrations detected in groundwater are less than the state of Oregon freshwater acute or chronic water quality criteria (DEQ, 1994) (see Table 7). These criteria reflect the latest scientific information regarding adverse effects of chemicals in surface water to aquatic life, wildlife, and vegetation. Also, although groundwater beneath the site discharges to the Willamette River, the volume of water that enters the river is expected to be a small fraction of the volume of water that flows past the site and concentrations of these chemicals, if present in groundwater discharging to the river, will be substantially reduced.

In addition, it should be noted that the four VOC compounds detected, while handled by GWCC, represent a much smaller amount than other chemicals handled in the area of monitoring well EX-1. GWCC on a routine basis formulates toluene, xylenes, acetone, 2-butanone (MEK), and 4-methyl-2-pentanone (MIBK). These compounds were not detected in the samples analyzed. Because the handling of chlorinated VOC by GWCC is much rarer than the previously listed compounds, these should have been detected with the chlorinated VOC if a release had occurred. The fact that they were not suggests that the four VOC detected may be form another source or predate GWCC operations.

To evaluate if an upgradient source of VOC is present, EMCON reviewed data from work conducted at the upgradient Chevron Willbridge Asphalt Refinery. The data reviewed is summarized in the report *Environmental Site Assessment Report, Chevron Willbridge Asphalt Refinery, 5501 NW Front Avenue, Portland, Oregon*, dated November 4, 1993, prepared for Chevron USA Products Company by SEACOR. This data is of limited value in that chlorinated VOC was not analyzed for during the Chevron assessment. TPH and BTEX concentrations were generally low at the downgradient Chevron property line, with the exception of benzene exceeding its MCL in one sample. Benzene was not detected in the samples from the McCall/GWCC site.

LIMITATIONS

The services described in this report were performed consistent with generally accepted professional consulting principles and practices. No other warranty, express or implied, is made. These services were performed consistent with our agreement with our client. This report is solely for the use and information of our client unless otherwise noted. Any reliance on this report by a third party is at such party's sole risk.

Opinions and recommendations contained in this report apply to conditions existing when services were performed and are intended only for the client, purposes, locations, time frames, and project parameters indicated. We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services. We do not warrant the accuracy of information supplied by others, nor the use of segregated portions of this report.

The purpose of a geologic/hydrogeologic study is to reasonably characterize existing site conditions based on the geology/hydrogeology of the area. In performing such a study, it is understood that a balance must be struck between a reasonable inquiry into the site conditions and an exhaustive analysis of each conceivable environmental characteristic. The following paragraphs discuss the assumptions and parameters under which such an opinion is rendered.

No investigation is thorough enough to describe all geologic/ hydrogeologic conditions of interest at a given site. If conditions have not been identified during the study, such a finding should not therefore be construed as a guarantee of the absence of such conditions at the site, but rather as the result of the services performed within the scope, limitations, and cost of the work performed.

We are unable to report on or accurately predict events that may change the site conditions after the described services are performed, whether occurring naturally or caused by external forces. We assume no responsibility for conditions we were not authorized to evaluate, or conditions not generally recognized as predictable when services were performed.

Geologic/hydrogeologic conditions may exist at the site that cannot be identified solely by visual observation. Where subsurface exploratory work was performed, our professional opinions are based in part on interpretation of data from discrete sampling locations that may not represent actual conditions at unsampled locations.

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Table 1

McCall Oil/Great Western Chemical Company
Soil Sampling

Boring	Sample	Depth Collected (ft bgs)
EX-1	EX1-0994-01	5
	EX1-0994-02	15.5
EX-2	EX2-0994-01	5
	EX2-0994-02	18
EX-3	EX3-0994-01	5
	EX3-0994-02	16.5

NOTE:
Samples analyzed for TPH by USEPA Method 8015 Modified.
ft bgs = feet below ground surface.

Table 2

McCall Oil/Great Western Chemical Company
Monitoring Well Construction Details

Boring	Total Depth (ft bgs)	Screened Interval (ft bgs)	Sand Pack Interval (ft bgs)	Bentonite Interval (s) (ft bgs)	Concrete Seal (ft bgs)
EX-1	25.0	9.0 - 24.0	24.0 - 7.0	25.0 - 24.0 / 7.0 - 1.5	1.5 - 0.0
EX-2	25.5	24.8 - 9.8	24.8 - 7.8	25.5 - 24.8/7.8 - 1.5	1.5 - 0.0
EX-3	26.0	24.5 - 9.5	24.5 - 7.5	26.0 - 24.5/7.5 - 1.5	1.5 - 0.0

NOTE:

Screen consists of 2-inch-diameter schedule 40 machine-slotted 0.010-inch PVC casing.

Riser consists of 2-inch-diameter schedule 40 blank PVC.

Sand pack consists of graded 20 x 40 washed silica sand.

Bentonite intervals consist of 3/8-inch chips hydrated with potable water.

ft bgs = feet below ground surface.

Table 3

McCall Oil/Great Western Chemical Company
Well-Development Details

Monitoring Well	Gallons Removed	Pore Volumes Removed	pH	Specific Conductance	Temperature (°C)
EX-1	5	3.8	4.64	1540	20.2
	10	7.7	4.49	1550	19.9
	15	11.5	4.36	1620	20.3
	20	15.4	4.36	1616	20.4
EX-2	5	5	6.67	751	17.9
	10	10	6.77	708	17.7
	15	15	6.73	716	17.6
	20	20	6.77	722	18.3
EX-3	5	5	6.22	528	17.2
	10	10	6.45	653	17.5
	15	15	6.78	662	18.1
	16	16	6.74	644	18.1

NOTE:
Specific conductance normalized to µmhos/cm at 25° C.

Table 4

McCall Oil/Great Western Chemical Company
Groundwater Sampling Field Parameters

Monitoring Well	Sample	Depth to Water (ft below TOC)	pH	Specific Conductance	Temperature (°C)
EX-1	GWCC-0994-02	15.35	4.37	1437	19.6
	GWCC-0994-03	--	--	--	--
EX-2	GWCC-0994-04	18.56	6.86	673	17.7
EX-3	GWCC-0994-05	17.96	6.85	602	16.5
	GWCC-0994-06	--	--	--	--
EX-4	GWCC-0994-01	16.86	6.6	484	18

NOTE:
Samples analyzed for TPH by USEPA Method 8015 Modified; for benzene, toluene, ethylbenzene, and total xylenes by USEPA Method 8020. Sample GWCC-0994-02 analyzed for VOCs by USEPA Method 8240.
Specific conductance normalized to µmhos/cm at 25° C.
ft below TOC = feet below top of casing.

Table 5

McCall Oil/Great Western Chemical Company
Soil Analytical Results

Boring	Sample Name	Sample Depth (ft)	TPH (8015M)					
			Gasoline	Mineral Spirits	Jet Fuel	Kerosene	Diesel	Other
EX-1	EX1-0994-01	5	ND	ND	ND	ND	ND	321
	EX1-0994-02	15.5	ND	ND	ND	ND	ND	ND
EX-2	EX2-0994-01	5	ND	ND	ND	ND	ND	55
	EX2-0994-02	18	ND	ND	ND	ND	ND	ND
EX-3	EX3-0994-01	5	ND	ND	ND	ND	ND	ND
	EX3-0994-02	16.5	ND	ND	ND	ND	ND	ND

NOTE:
All units expressed in milligrams per kilogram.

Table 6

McCall Oil/Great Western Chemical Company
Groundwater Analytical Results

		TPH (8015M)						BTEX (8020)				VOC[a] (8240)			
Well I.D.	Sample Name	Gasoline	Mineral Spirits	Jet Fuel	Kerosene	Diesel	Other	Benzene	Toluene	Ethyl-benzene	Total Xylenes	1,1-dichloro-ethene	1,1,1-Trichloro-ethene	Trichloro-ethene	Tetrachloro-ethene
EX-1	GWCC-0994-02	ND	ND	ND	ND	ND	266	ND	ND	ND	ND	7	180	160	650[b]
Duplicate	GWCC-0994-03	--[c]	--	--	--	--	--	--	--	--	--	7	170	150	620[b]
EX-2	GWCC-0994-04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	--	--	--
EX-3	GWCC-0994-05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	--	--	--
Duplicate	GWCC-0994-906	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	--	--	--
EX-4	GWCC-0994-01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	--	--	--

NOTE:
[a] Only the volatile organic compounds that were above the method reporting limit are listed on this table.
[b] Result is from analysis of a diluted sample.
[c] Not analyzed.
[d] All units reported in micrograms per liter (µg/L).

Table 7

McCall Oil and Chemical Company
Comparison of Concentrations to
USEPA-Established MCLs and Water Quality Criteria

Chemicals	Concentration Detected On-Site (μg/L)	WQC[b]		
		MCL[a] (μg/L)	Acute (μg/L)	Chronic (μg/L)
Tetrachloroethene	650	5	5,280	840
1,1-Dichloroethene	7	7	11,600[c]	NA
1,1,1-Trichloroethane	180	200	18,000[d]	NA
Trichloroethene	160	5	45,000	21,900

NOTE:
WQC = water quality criteria.
NA = not available.
[a] From USEPA, 1994.
[b] From DEQ, 19___.
[c] Criteria for dichloroethylenes.
[d] Criteria for trichloroethanes.

Base Map From: USGS 7.5' quads. PORTLAND and LINNTON, OREG. (1977, 1984)

0 2000 4000

Scale in Feet

N

EMCON Northwest, Inc.

DATE 3/94
DWN. mk
APPR.
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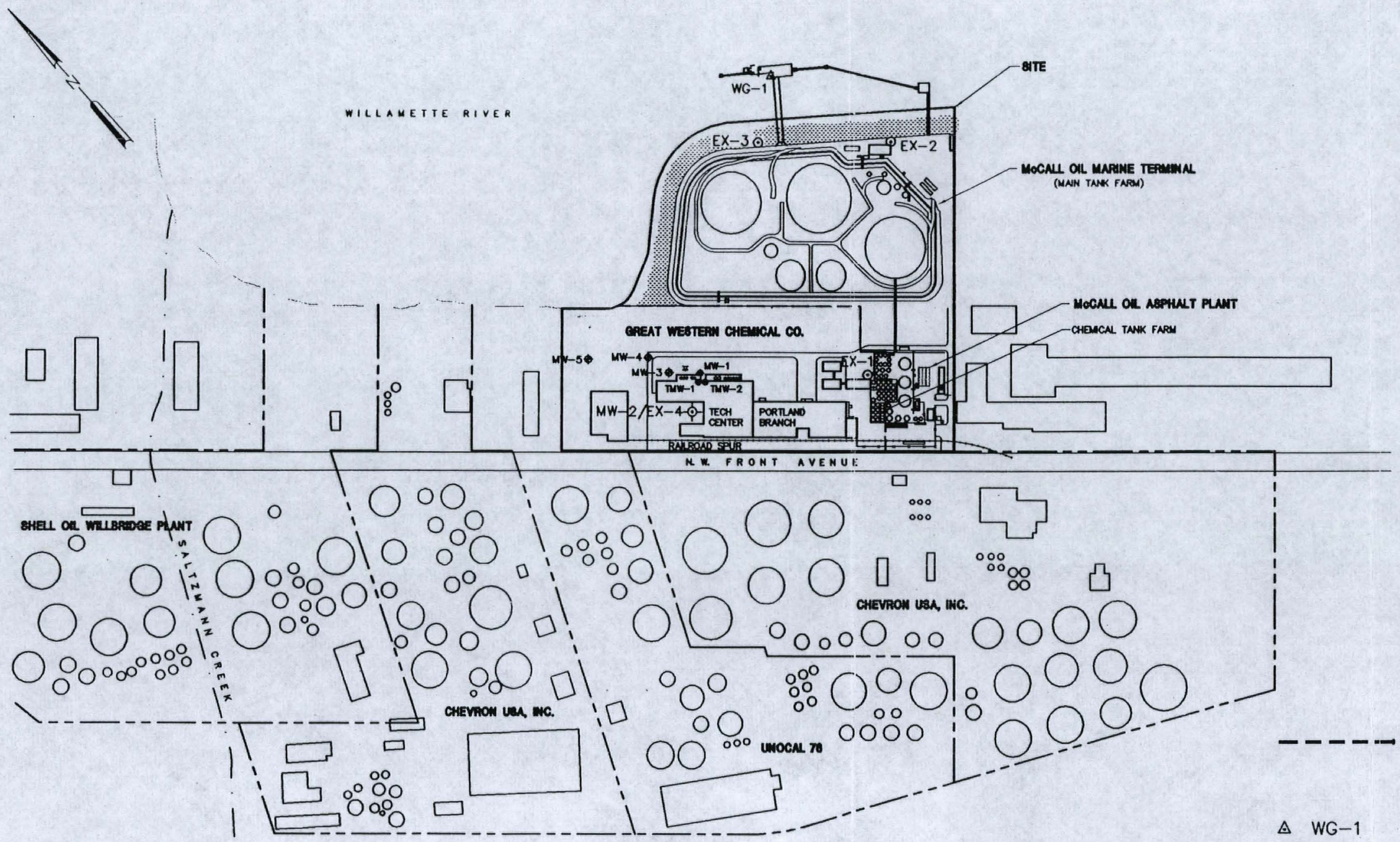
PROJECT NO. 0235007.09

Figure 1
McCALL OIL AND CHEMICAL CORPORATION
PORTLAND, OREGON

LOCATION MAP



LEGEND:

- - - - -	McCALL OIL/GREAT WESTERN CHEMICAL PLANT BOUNDARY
△ WG-1	WILLAMETTE RIVER GAGE
◆ MW-5	EXISTING MONITORING WELL
⊙ EX-1	XPA (EXTENDED PA) MONITORING WELL
-⊕- MW-2/EX-4	XPA UPGRADIENT MONITORING WELL

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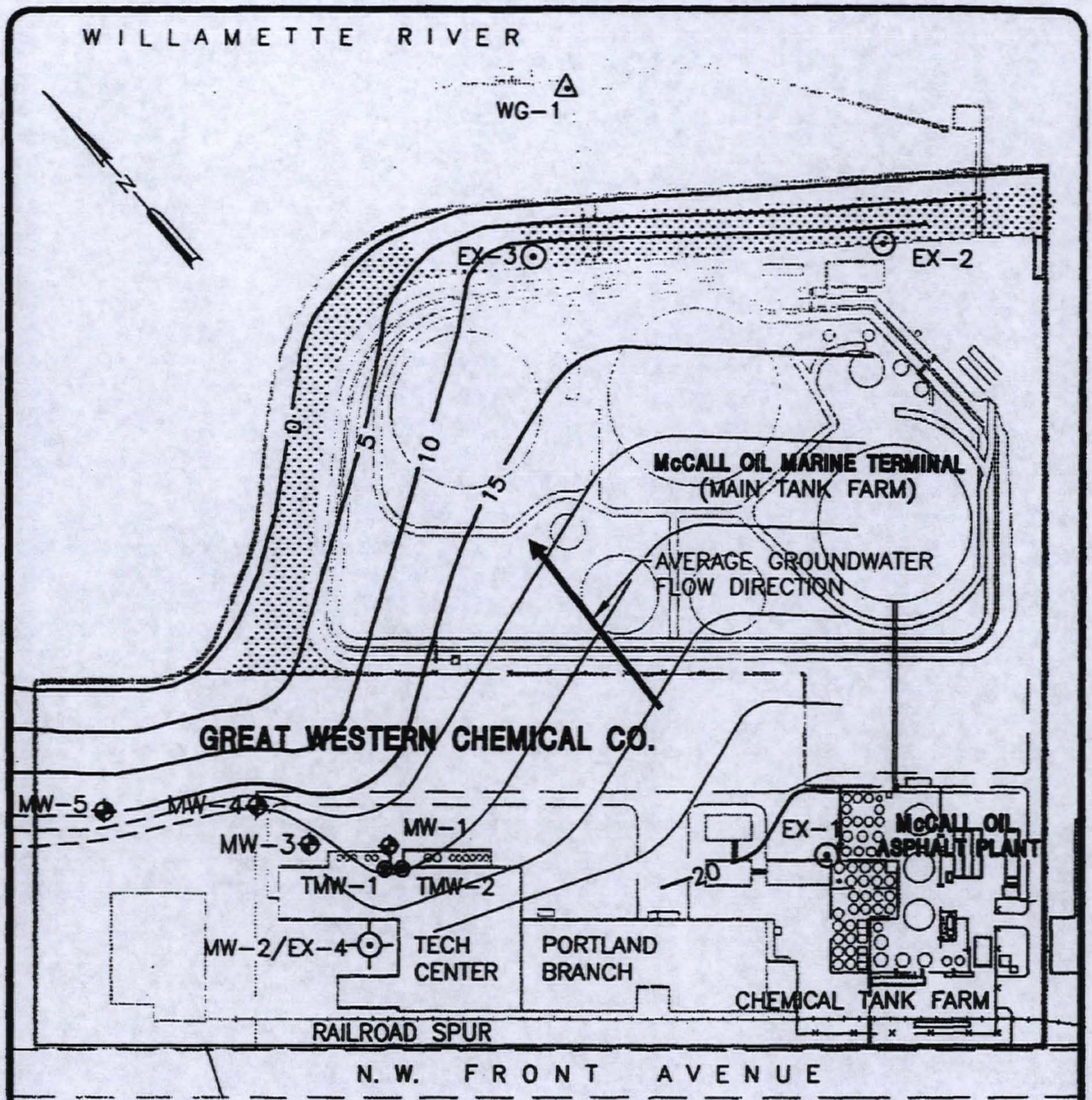
APPR.
REVIS.
PROJECT NO.
0235007.09

Figure 2
McCALL OIL AND CHEMICAL CORPORATION
PORTLAND, OREGON

SITE MAP

G:\DWG\0234\003\05A-1 7/27/94 K PLOT 1=200



LEGEND:

NOTE:
WATER LEVEL ELEVATION AT WG-2 IS WITHIN 1 FOOT OF ACTUAL ELEVATION.

0 100 200
SCALE IN FEET

— — —	McCALL OIL/GREAT WESTERN CHEMICAL PLANT BOUNDARY
▲ WG-1	WILLAMETTE RIVER GAGE
⊕ MW-5	EXISTING MONITORING WELL
⊙ EX-1	XPA (EXTENDED PA) MONITORING WELL
-⊙- MW-2/EX-4	XPA UPGRADIENT MONITORING WELL

EMCON
Northwest, Inc.

DATE 10/94
DWN. RJF
APPR.
REVIS.
PROJECT NO.
0235007.09

Figure 3
McCALL OIL AND CHEMICAL CORP.
PORTLAND, OREGON
ESTIMATED POTENTIOMETRIC SURFACE
SEPTEMBER 28, 1994

G:\DWG\0234\003\05F3 10-20-94 RJF PLOT 1=100

APPENDIX A

BORING LOGS AND WELL CONSTRUCTION DIAGRAM

LOG OF EXPLORATORY BORING

PROJECT NAME McCALL OIL/GREAT WESTERN CHEMICAL CO.
LOCATION Portland, Oregon
DRILLED BY GeoTech Explorations
DRILL METHOD Hollow Stem Auger
LOGGED BY Bill Ehorn

BORING NO. EX- 1
PAGE 1 OF 2
REFERENCE ELEV. ±
TOTAL DEPTH 25.00'
DATE COMPLETED 9/6/94

SAMPLE NUMBER (METHOD)	FID (ppm) RECOVERY PERCENT	BLOW COUNTS	GROUND WATER LEVELS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION
					0-0.2 feet: ASPHALT.
1 (G)	275 100%	—			0.2-3.0 feet: SILTY SAND (SM), medium brown, 70-80% subrounded to subangular fine to medium sand, 20-30% non-plastic fines, damp, loose.
2 (G)	425 100%	—			@ 2.5 feet: color of silty sand turned orange brown. Fines decrease to 10-20%.
3 (G)	270 100%	—		5	3.0-23.7 feet: POORLY GRADED SAND WITH SILT (SP-SM), orange brown, 85-90% subrounded to subangular fine sand, 10-15% non-plastic fines, damp, loose. (DREDGE SPOILS)
4 (SS)	600 100%	2-4-4			
5 (SS)	95 100%	2-2-5			
6 (SS)	10 100%	2-2-5		10	
7 (SS)	50 100%	2-3-3			
8 (SS)	35 100	2-3-3			
9 (SS)	50 100%	2-2-3	15.35'	15	
10 (SS)	5 100%	4-5-5	16.5'		@ 16.5 feet: first water, cuttings are wet.
11 (SS)	3 100%	3-2-3			
12 (SS)	50 100%	3-3-2		20	

REMARKS

1)SS=2-inch split spoon sampler. 2)G=Grab sample. 3)FID=Flame ionzation detector.

EMCON Northwest, Inc.

0235-007.05.23505.mmm\0.9-21-94...SEELSW

LOG OF EXPLORATORY BORING

PROJECT NAME	**McCALL OIL/GREAT WESTERN CHEMICAL CO.**	BORING NO.	**EX- 1**
LOCATION	**Portland, Oregon**	PAGE	**2 OF 2**
DRILLED BY	**GeoTech Explorations**	REFERENCE ELEV.	**±**
DRILL METHOD	**Hollow Stem Auger**	TOTAL DEPTH	**25.00'**
LOGGED BY	**Bill Ehorn**	DATE COMPLETED	**9/6/94**

SAMPLE NUMBER (METHOD)	FID (ppm) RECOVERY PERCENT	BLOW COUNTS	GROUND WATER LEVELS	DEPTH IN FEET	SAMPLES	WELL DETAILS	LITHO LOGIC COLUMN	LITHOLOGIC DESCRIPTION
13 (SS)	— 100%	2-2-3						
14 (SS)	3 100%	4-5-11						@ 22.5-23.0 feet: color changed to gray.
15 (SS)	— 100%	2-3-4						**23.7-25.0 feet: ELASTIC SILT (MH)**, medium gray, medium plasticity, moist, firm, trace organic matter. (ALLUVIUM)
				25				Bottom of boring at 25.0 feet below ground surface.
				30				
				35				
				40				

WELL CONSTRUCTION DETAILS:

Well was constructed of 2-inch flush threaded schedule 40 PVC with a 0.010-inch machine slotted screen. The filter pack consists of washed 20x40 Colorado silica sand. The surface seal consists of Volclay bentonite chips hydrated with potable water. The well was completed with a heavy duty flush mount security casing cemented into place.

REMARKS

1)SS = 2-inch split spoon sampler. 2)G = Grab sample. 3)FID = Flame ionzation detector.

EMCON Northwest, Inc.

0235-007.05.23505.mmm\0.9-21-94...SEELSW

LOG OF EXPLORATORY BORING

PROJECT NAME McCALL OIL/GREAT WESTERN CHEMICAL CO.
LOCATION Portland, Oregon
DRILLED BY GeoTech Explorations
DRILL METHOD Hollow Stem Auger
LOGGED BY Bill Ehorn

BORING NO. EX- 2

REFERENCE ELEV. ±
TOTAL DEPTH 25.50'
DATE COMPLETED 9/6/94

SAMPLE NUMBER (METHOD)	FID (ppm) RECOVERY PERCENT	BLOW COUNTS	GROUND WATER LEVELS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION
					0-0.2 feet: ASPHALT.
1 (G)	0 100%	---			0.2-1.5 feet: SILTY GRAVEL WITH SAND (GM), medium brown, 40-50% subangular to angular fine gravel, 30-40% subrounded to subangular fine to coarse sand, 10-20% non-plastic fines, damp. (FILL)
2 (G)	0 100%	---			
3 (G)	0 100%	---			1.5-25.5 feet: POORLY GRADED SAND WITH SILT (SP-SM), medium gray, 85-90% subrounded to subangular fine sand, 10-15% non-plastic fines, medium dense, damp. (DREDGE SPOILS)
				5	
4 (G)	0 100%	---			
5 (SS)	0 100%	6-9-9			
6 (SS)	60 100%	4-5-6			
7 (SS)	5 100%	10-8-10		10	@ 10.0 feet: noticeable white quartz sand grains.
8 (SS)	10 100	6-7-7			@ 11.5 feet: iron oxide staining evident.
9 (SS)	110 100%	4-4-4			
10 (SS)	70 100%	4-5-7		15	
11 (SS)	105 100%	3-4-8			
12 (SS)	2 100%	4-10-11	18.5' ▽ ▼		@ 18.5 feet: first water, cuttings are wet.
13 (SS)	2600 100%	12-10-14	18.56'		
				20	

REMARKS

1)SS = 2-inch split spoon sampler. 2)G = Grab sample. 3)FID = Flame ionzation detector.

LOG OF EXPLORATORY BORING

PROJECT NAME **McCALL OIL/GREAT WESTERN CHEMICAL CO.**
LOCATION **Portland, Oregon**
DRILLED BY **GeoTech Explorations**
DRILL METHOD **Hollow Stem Auger**
LOGGED BY **Bill Ehorn**

BORING NO. **EX- 2**
PAGE **2 OF 2**
REFERENCE ELEV. **±**
TOTAL DEPTH **25.50'**
DATE COMPLETED **9/6/94**

SAMPLE NUMBER (METHOD)	FID (ppm) RECOVERY PERCENT	BLOW COUNTS	GROUND WATER LEVELS	DEPTH IN FEET	SAMPLES	WELL DETAILS	LITHO LOGIC COLUMN	LITHOLOGIC DESCRIPTION
14 (SS)	3000 100%	4-4-5						
15 (SS)	3050 100%	3-1-2						
								@ 22.7-25.5 feet: interbedded elastic silt lenses with traces of organic matter.
16 (SS)	4100 100%	2-6-7						
				25				
								Bottom of boring at 25.5 feet below ground surface.
								WELL CONSTRUCTION DETAILS: Well was constructed of 2-inch flush threaded schedule 40 PVC with a 0.010-inch machine slotted screen. The filter pack consists of washed 20x40 Colorado silica sand. The surface seal consists of Volclaybentonite chips hydrated with potable water. The well was completed with a heavy duty flush mount security casing cemented into place.
				30				
				35				
				40				

REMARKS

1)SS = 2-inch split spoon sampler. 2)G = Grab sample. 3)FID = Flame ionzation detector.

LOG OF EXPLORATORY BORING

PROJECT NAME **McCALL OIL/GREAT WESTERN CHEMICAL CO.**
LOCATION **Portland, Oregon**
DRILLED BY **GeoTech Explorations**
DRILL METHOD **Hollow Stem Auger**
LOGGED BY **Bill Ehorn**

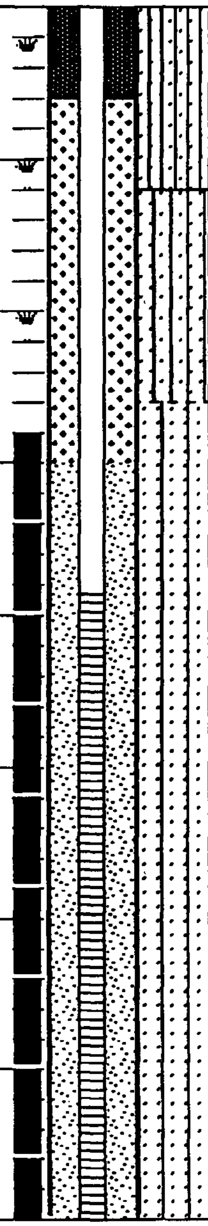
BORING NO. **EX- 3**

REFERENCE ELEV. **±**
TOTAL DEPTH **26.00'**
DATE COMPLETED **9/6/94**

SAMPLE NUMBER (METHOD)	FID (ppm) RECOVERY PERCENT	BLOW COUNTS	GROUND WATER LEVELS
1 (G)	0 100%	---	
2 (G)	0 100%	---	
3 (G)	0 100%	---	
4 (SS)	650 100%	8-7-5	
5 (SS)	400 100%	3-4-3	
6 (SS)	1100 100%	4-5-6	
7 (SS)	750 100%	4-4-6	
8 (SS)	1050 100%	4-3-3	
9 (SS)	700 100%	4-5-7	
10 (SS)	750 100%	4-8-8	17.0'
11 (SS)	3000 100%	4-5-7	17.96'
12 (SS)	1040 100%	7-4-5	

DEPTH IN FEET: 5, 10, 15, 20

SAMPLES / WELL DETAILS / LITHO LOGIC COLUMN



LITHOLOGIC DESCRIPTION

0-3.0 feet: SILTY SAND-SANDY SILT (SM/ML), orange brown, 40-60% subrounded to subangular fine sand, 40-60% non-plastic fines, dry, loose.

3.0-6.5 feet: SILTY SAND (SM), medium gray, 75-85% subrounded to subangular fine sand, 15-25% non-plastic fines, dry, soft. (DREDGE SPOILS)

6.5-25.5 feet: POORLY GRADED SAND WITH SILT (SP-SM), dark gray, 90-95% subrounded to subangular fine sand, 5-10% non-plastic fines, dry, loose. (DREDGE SPOILS)

@ 17.0 feet: first water, wet cuttings.

@ 19.0 feet: iron oxide staining evident.

REMARKS

1)SS = 2-inch split spoon sampler. 2)G = Grab sample. 3)FID = Flame Ionzation detector.

EMCON Northwest, Inc.

0235-007.05.23506.mmm\0.9-21-94...SEELSW

LOG OF EXPLORATORY BORING

PROJECT NAME	**McCALL OIL/GREAT WESTERN CHEMICAL CO.**	BORING NO.	**EX- 3**
LOCATION	**Portland, Oregon**	PAGE	**2 OF 2**
DRILLED BY	**GeoTech Explorations**	REFERENCE ELEV.	**±**
DRILL METHOD	**Hollow Stem Auger**	TOTAL DEPTH	**26.00'**
LOGGED BY	**Bill Ehorn**	DATE COMPLETED	**9/6/94**

SAMPLE NUMBER (METHOD)	FID (ppm) RECOVERY PERCENT	BLOW COUNTS	GROUND WATER LEVELS	DEPTH IN FEET	SAMPLES	WELL DETAILS	LITHO LOGIC COLUMN	LITHOLOGIC DESCRIPTION
13 (SS)	3100 100%	1-2-2						
14 (SS)	5500 100%	1-2-3						
15 (SS)	4500 100%	2-3-3		25				
								25.5-26.0 feet: ELASTIC SILT (MH), medium gray, medium plasticity, firm, trace organic matter, moist. (ALLUVIUM)
								Bottom of boring at 26.0 feet below ground surface.
				30				
				35				
				40				

WELL CONSTRUCTION DETAILS:

Well was constructed of 2-inch flush threaded schedule 40 PVC with a 0.010-inch machine slotted screen. The filter pack consists of washed 20x40 Colorado silica sand. The surface seal consists of Volclay bentonite chips hydrated with potable water. The well was completed with a heavy duty flush mount security casing cemented into place.

REMARKS

1)SS = 2-inch split spoon sampler. 2)G = Grab sample. 3)FID = Flame ionzation detector.

EMCON Northwest, Inc.

0235-007.05.23505.mmm\0.9-21-94...SEELSW

APPENDIX B

CHAIN-OF-CUSTODY DOCUMENTATION AND LABORATORY REPORTS

MEMORANDUM

TO: McCall Oil Project File
0235-007.09 - Task 4

DATE: October 18, 1994

FROM: Lynn Simpson LMS

RE: Data Validation - September 1994 Soil and Water Sampling
Work Order Numbers K945448 and K945484

EMCON personnel collected six soil samples on September 6, 1994 and six water samples on September 8, 1994. Samples were submitted to Columbia Analytical Services (CAS) for EPA Method 8015M (Hydrocarbon Scan). Some water samples were also analyzed for BTEX by EPA Method 8020 and volatile organic compounds by EPA Method 8240. Data was validated according to EPA Functional Guidelines.

DATA VALIDATION

- Holding Times - Analytes were performed within holding time criteria.

- Blanks - No analytes were detected in the laboratory method blanks, which were analyzed at the appropriate frequency.

- Surrogate Recoveries - Surrogate recoveries were reported for all appropriate samples. Recoveries were within acceptance limits.

- Overall Assessment - The data are judged to be acceptable for use. No data qualifiers were assigned.

ORIGINAL IS
ON PROJECT
FILING

Columbia Analytical Services inc.

RECEIVED
SEP 1 9 1994
PORTLAND OFFICE

September 15, 1994

Service Request No.: K945448

Jim Maul
EMCON Northwest, Inc.
15055 SW Sequoia Parkway, Suite 140
P.O. Box 231269
Portland, OR 97224

Re: **McCall/GWCC/Project #0235-007.05**

Dear Jim:

Enclosed are the results of the sample(s) submitted to our laboratory on September 7, 1994. For your reference, these analyses have been assigned our service request number K945448.

All analyses were performed consistent with our laboratory's quality assurance program. All results are intended to be considered in their entirety, and Columbia Analytical Services, Inc. (CAS) is not responsible for use of less than the complete report. Results apply only to the samples analyzed.

Please call if you have any questions. My extension is 239.

Respectfully submitted,
Columbia Analytical Services, Inc.

Howard Boorse

Howard Boorse
Project Chemist

HB/rr

317 South 13th Avenue • P.O. Box 479 • Kelso, Washington 98626 • Telephone 206/577-7222 • Fax 206/636-1068

COLUMBIA ANALYTICAL SERVICES, Inc.

Acronyms

ASTM	American Society for Testing and Materials
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LUFT	Leaking Underground Fuel Tank
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NAN	Not Analyzed
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected at or above the MRL
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Northwest	**Service Request:**	K945448
Project:	McCall/GWCC/#0235-007.05	**Date Collected:**	9/6/94
Sample Matrix:	Soil	**Date Received:**	9/7/94
		Date Extracted:	9/9/94

Hydrocarbon Scan
EPA Methods 3550/8015M
Units: mg/Kg (ppm)
Dry Weight Basis

		Sample Name:	EX1-0994-01	EX1-0994-02	EX2-0994-01
		Lab Code:	K945448-001	K945448-002	K945448-003
		Date Analyzed:	9/12/94	9/12/94	9/12/94
Analyte	**MRL**				
Gasoline	10		ND	ND	ND
Mineral Spirits	10		ND	ND	ND
Jet Fuel	10		ND	ND	ND
Kerosene	10		ND	ND	ND
Diesel	10		ND	ND	ND
Other*	20		321	ND	55

* Quantified using 30-weight motor oil as a standard.

Approved By: Ulandanr Date: 9/14/94

S5448HSC.XLS - 8015Soil 9/14/94

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Northwest	**Service Request:**	**K945448**
Project:	McCall/GWCC/#0235-007.05	**Date Collected:**	**9/6/94**
Sample Matrix:	Soil	**Date Received:**	**9/7/94**
		Date Extracted:	**9/9/94**

Hydrocarbon Scan
EPA Methods 3550/8015M
Units: mg/Kg (ppm)
Dry Weight Basis

		Sample Name:	EX2-0994-02	EX3-0994-01	EX3-0994-02
		Lab Code:	K945448-004	K945448-005	K945448-006
		Date Analyzed:	9/13/94	9/13/94	9/13/94
Analyte	**MRL**				
Gasoline	10		ND	ND	ND
Mineral Spirits	10		ND	ND	ND
Jet Fuel	10		ND	ND	ND
Kerosene	10		ND	ND	ND
Diesel	10		ND	ND	ND
Other*	20		ND	ND	ND

* Quantified using 30-weight motor oil as a standard.

Approved By: Ulandaner Date: 9/14/94

S5448HSC.XLS - 8015Soil (2) 9/14/94

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Northwest	**Service Request:**	K945448
Project:	McCall/GWCC/#0235-007.05	**Date Collected:**	9/6/94
Sample Matrix:	Soil	**Date Received:**	9/7/94
		Date Extracted:	9/9/94

Hydrocarbon Scan
EPA Methods 3550/8015M
Units: mg/Kg (ppm)
Dry Weight Basis

Sample Name:	Method Blank
Lab Code:	K940909-SB
Date Analyzed:	9/12/94

Analyte	MRL	
Gasoline	10	ND
Mineral Spirits	10	ND
Jet Fuel	10	ND
Kerosene	10	ND
Diesel	10	ND
Other*	20	ND

* Quantified using 30-weight motor oil as a standard.

Approved By: Ulandaur Date: 9/14/94

S5448HSC.XLS - 8015Soil (3) 9/14/94

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	**EMCON Northwest**	**Service Request:**	**K945448**
Project:	**McCall/GWCC/#0235-007.05**	**Date Collected:**	**9/6/94**
Sample Matrix:	**Soil**	**Date Received:**	**9/7/94**
		Date Extracted:	**9/9/94**
		Date Analyzed:	**9/12,13/94**

Surrogate Recovery Summary
Hydrocarbon Scan
EPA Methods 3550/8015M

Sample Name	Lab Code	Percent Recovery o-Terphenyl
EX1-0994-01	K945448-001	80
EX1-0994-02	K945448-002	68
EX2-0994-01	K945448-003	88
EX2-0994-02	K945448-004	76
EX3-0994-01	K945448-005	84
EX3-0994-02	K945448-006	80
EX1-0994-02	K945448-002D	76
EX2-0994-01	K945448-003MS	80
Laboratory Control Sample	K940909-SL	79
Method Blank	K940909-SB	84

CAS Acceptance Limits: 55-119

Approved By: Ulandenr Date: 9/14/94

Columbia Analytical Services inc.

1317 South 13th Ave. • Kelso, WA 98626 • (206) 577-7222, FAX (206) 636-1068

CHAIN OF CUSTODY/LABORATORY ANALYSIS REQUEST FORM

DATE 9/7/94 PAGE 1 OF 1

PROJECT NAME McCall/GWCC #0235007.05

PROJECT MNGR. Jim Maul

COMPANY/ADDRESS EMCON Northwest

Portland OR.

PHONE 524-7200

SAMPLERS SIGNATURE [signature]

ANALYSIS REQUESTED

SAMPLE I.D.	DATE	TIME	LAB I.D.	SAMPLE MATRIX	NUMBER OF CONTAINERS	Base/Neu/Acid Organics GC/MS 625/8270	Volatile Organics GC/MS 624/8240	Halogenated or Aromatic Volatiles 601/8010 □ 602/8020 □	Pesticides/PCBs 608/8080	Total Petroleum Hydrocarbons EPA 418.1	TPH/Gas/BTEX 5030/8015/8020 Gas □ BTEX □ Oregon 418.1 □	TPH/8015 Modified Diesel □ Hydrocarbon Scan □	TPH - HCID	TCLP Metals □ VOA □ Semi VOA □ Pest □ Herb □	Metals (total or dissolved) List Below	Cyanide	pH, Cond, Cl, SO_4, PO_4, F, Br NO_2, NO_3 (circle)	NH_3-N, COD, Total-P, TKN, TOC (circle)	Total Organic Halides (TOX) 9020			REMARKS
EX1-0994-01	9/6/94	1630		Soil	1							X										
EX1-0994-02	↓	1655			1							X										
EX2-0994-01		1005			1							X										
EX2-0994-02		1020			1							X										
EX3-0994-01		1310			1							X										
EX3-0994-02	↓	1325		↓	1							X										

RELINQUISHED BY:
[signature]
Signature
Bill Ebom
Printed Name
EMCON
Firm
9/7/94 0930
Date/Time

RECEIVED BY:
[signature]
Signature
Jean Adair
Printed Name
CAS
Firm
9/8/94 1630
Date/Time

TURNAROUND REQUIREMENTS:
___ 24 hr ___ 48 hr ___ 5 day
___ Standard (~ 10-15 working days)
___ Provide Verbal Preliminary Results
___ Provide FAX Preliminary Results
Requested Report Date ___

REPORT REQUIREMENTS
___ I. Routine Report
___ II. Report (includes DUP,MS, MSD, as required, may be charged as samples)
___ III. Data Validation Report (includes All Raw Data)
___ IV.CLP Deliverable Report

INVOICE INFORMATION:
P.O. # ___
Bill to: ___

SAMPLE RECEIPT:
Shipping VIA: Courier
Shipping # Ecol # 2957
Condition: ___
Lab No.: K94/5448

RELINQUISHED BY:
Signature
Printed Name
Firm
Date/Time

RECEIVED BY:
Signature
Printed Name
Firm
Date/Time

SPECIAL INSTRUCTIONS/COMMENTS:

00007

DISTRIBUTION: WHITE - return to originator; YELLOW - lab; PINK - retained by originator

400-05

RECEIVED
SEP 27 1994
PORTLAND OFFICE

Columbia Analytical Services INC.

September 26, 1994

Service Request No.: K945484

Jim Maul
EMCON Northwest, Inc.
15055 SW Sequoia Parkway, Suite 140
P.O. Box 231269
Portland, OR 97224

Re: **McCall/GWCC/Project #0235-007.05**

Dear Jim:

Enclosed are the results of the sample(s) submitted to our laboratory on September 8, 1994. For your reference, these analyses have been assigned our service request number K945484.

All analyses were performed consistent with our laboratory's quality assurance program. All results are intended to be considered in their entirety, and Columbia Analytical Services, Inc. (CAS) is not responsible for use of less than the complete report. Results apply only to the samples analyzed.

Please call if you have any questions. My extension is 239.

Respectfully submitted,

Columbia Analytical Services, Inc.

Howard Boorse
Howard Boorse
Project Chemist

HB/td

1317 South 13th Avenue • P.O. Box 479 • Kelso, Washington 98626 • Telephone 206/577-7222 • Fax 206/636-106

COLUMBIA ANALYTICAL SERVICES, Inc.

Acronyms

ASTM	American Society for Testing and Materials
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LUFT	Leaking Underground Fuel Tank
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NAN	Not Analyzed
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected at or above the MRL
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Northwest	**Service Request:**	K945484
Project:	McCall/GWCC/#0235-007.05	**Date Collected:**	9/8/94
Sample Matrix:	Water	**Date Received:**	9/8/94
		Date Extracted:	9/13/94

Hydrocarbon Scan
EPA Methods 3510/8015M
Units: µg/L (ppb)

		Sample Name:	GWCC-0994-01	GWCC-0994-02	GWCC-0994-04
		Lab Code:	K945484-001	K945484-002	K945484-004
		Date Analyzed:	9/22/94	9/22/94	9/22/94
Analyte	**MRL**				
Gasoline	50		ND	ND	ND
Mineral Spirits	50		ND	ND	ND
Jet Fuel	50		ND	ND	ND
Kerosene	50		ND	ND	ND
Diesel	50		ND	ND	ND
Other*	200		ND	266	ND

* Quantified using 30-weight motor oil as a standard.

Approved By: Howard [signature] Date: 9/26/94

3S22/060194
W5484HSC.XLS - 8015H2O 9/23/94

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Northwest	**Service Request:**	K945484
Project:	McCall/GWCC/#0235-007.05	**Date Collected:**	9/8/94
Sample Matrix:	Water	**Date Received:**	9/8/94
		Date Extracted:	9/13/94

Hydrocarbon Scan
EPA Methods 3510/8015M
Units: µg/L (ppb)

		Sample Name:	GWCC-0994-05	GWCC-0994-06	Method Blank
		Lab Code:	K945484-005	K945484-006	K940913-WB
		Date Analyzed:	9/22/94	9/22/94	9/21/94
Analyte	**MRL**				
Gasoline	50		ND	ND	ND
Mineral Spirits	50		ND	ND	ND
Jet Fuel	50		ND	ND	ND
Kerosene	50		ND	ND	ND
Diesel	50		ND	ND	ND
Other*	200		ND	ND	ND

* Quantified using 30-weight motor oil as a standard.

Approved By: Howard Boone Date: 9/26/94

3S22/060194
W5484HSC.XLS - 8015H2O (2) 9/23/94

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Northwest	**Service Request:**	K945484
Project:	McCall/GWCC/#0235-007.05	**Date Collected:**	9/8/94
Sample Matrix:	Water	**Date Received:**	9/8/94
		Date Extracted:	NA
		Date Analyzed:	9/12,13/94

BTEX
EPA Methods 5030/8020
Units: µg/L (ppb)

	Analyte:	**Benzene**	**Toluene**	**Ethylbenzene**	**Total Xylenes**
	Method Reporting Limit:	0.5	1	1	1
Sample Name	**Lab Code**				
GWCC-0994-01	K945484-001	ND	ND	ND	ND
GWCC-0994-02	K945484-002	ND	ND	ND	ND
GWCC-0994-04	K945484-004	ND	ND	ND	ND
GWCC-0994-05	K945484-005	ND	ND	ND	ND
GWCC-0994-06	K945484-006	ND	ND	ND	ND
Method Blank	K940912-WB	ND	ND	ND	ND

Approved By: Howard Boone Date: 9/26/94

4A/061694

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Northwest, Inc.	**Date Received:**	09/08/94
Project:	McCall/GWCC/#0235-007.05	**Work Order No.:**	K945484
Sample Matrix:	Water		

Volatile Organic Compounds
EPA Method 8240
μg/L (ppb)

Sample Name:		GWCC-0994-02	GWCC-0994-03	Method Blank
Lab Code:		K945484-002	K945484-003	K945484-MB
Date Analyzed:		09/22/94	09/22/94	09/22/94
Analyte	**MRL**			
Chloromethane	10	ND	ND	ND
Vinyl Chloride	10	ND	ND	ND
Bromomethane	10	ND	ND	ND
Chloroethane	10	ND	ND	ND
Trichlorofluoromethane (Freon 11)	10	ND	ND	ND
Trichlorotrifluoroethane (Freon 113)	10	ND	ND	ND
1,1-Dichloroethene	5	7	7	ND
Acetone	100	ND	ND	ND
Carbon Disulfide	100	ND	ND	ND.
Methylene Chloride	5	ND	ND	ND
trans-1,2-Dichloroethene	5	ND	ND	ND
cis-1,2-Dichloroethene	5	ND	ND	ND
2-Butanone (MEK)	100	ND	ND	ND
1,1-Dichloroethane	5	ND	ND	ND
Chloroform	5	ND	ND	ND
1,1,1-Trichloroethane (TCA)	5	180	170	ND
Carbon Tetrachloride	5	ND	ND	ND
Benzene	5	ND	ND	ND
1,2-Dichloroethane	5	ND	ND	ND
Vinyl Acetate	50	ND	ND	ND
Trichloroethene (TCE)	5	160	150	ND
1,2-Dichloropropane	5	ND	ND	ND
Bromodichloromethane	5	ND	ND	ND
2-Chloroethyl Vinyl Ether	10	ND	ND	ND
trans-1,3-Dichloropropene	5	ND	ND	ND
2-Hexanone	50	ND	ND	ND
4-Methyl-2-pentanone (MIBK)	50	ND	ND	ND
Toluene	5	ND	ND	ND
cis-1,3-Dichloropropene	5	ND	ND	ND
1,1,2-Trichloroethane	5	ND	ND	ND
Tetrachloroethene (PCE)	5	[a]650	[a]620	ND
Dibromochloromethane	5	ND	ND	ND
Chlorobenzene	5	ND	ND	ND
Ethylbenzene	5	ND	ND	ND
Styrene	5	ND	ND	ND
Total Xylenes	5	ND	ND	ND
Bromoform	5	ND	ND	ND
1,1,2,2-Tetrachloroethane	5	ND	ND	ND
1,3-Dichlorobenzene	5	ND	ND	ND
1,4-Dichlorobenzene	5	ND	ND	ND
1,2-Dichlorobenzene	5	ND	ND	ND

a Result is from the analysis of a diluted sample, performed on September 23, 1994. Dilution factor: 5 times.

Approved by Howard Boone Date 9/26/94

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: EMCON Northwest
Project: McCall/GWCC/#0235-007.05
Sample Matrix: Water

Service Request: K945484
Date Collected: 9/8/94
Date Received: 9/8/94
Date Extracted: 9/13/94
Date Analyzed: 9/21,22/94

Surrogate Recovery Summary
Hydrocarbon Scan
EPA Methods 3510/8015M

Sample Name	Lab Code	Percent Recovery o-Terphenyl
GWCC-0994-01	K945484-001	80
GWCC-0994-02	K945484-002	80
GWCC-0994-04	K945484-004	80
GWCC-0994-05	K945484-005	81
GWCC-0994-06	K945484-006	75
Method Blank	K940913-WB	83

CAS Acceptance Limits: 46-120

Approved By: Howard Boone Date: 9/26/94

SUR1X/062994
W5484HSC.XLS - 8015SURW 9/23/94

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	EMCON Northwest	**Service Request:**	K945484
Project:	McCall/GWCC/#0235-007.05	**Date Collected:**	9/8/94
Sample Matrix:	Water	**Date Received:**	9/8/94
		Date Extracted:	NA
		Date Analyzed:	9/12,13/94

Surrogate Recovery Summary
BTEX
EPA Methods 5030/8020

Sample Name	**Lab Code**	**Percent Recovery** 4-Bromofluorobenzene
GWCC-0994-01	K945484-001	100
GWCC-0994-02	K945484-002	99
GWCC-0994-04	K945484-004	104
GWCC-0994-05	K945484-005	101
GWCC-0994-06	K945484-006	100
Method Blank	K940912-WB	100

CAS Acceptance Limits: 70-122

Approved By: Howard Boone Date: 9/26/94

SUR1/062994
5484BTEX.XLS - BTEXSUR 9/14/94

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	EMCON Northwest, Inc.	**Date Received:**	09/08/94
Project:	McCall/GWCC/#0235-007.05	**Date Analyzed:**	09/22/94
Sample Matrix:	Water	**Work Order No.:**	K945484

Surrogate Recovery Summary
Volatile Organic Compounds
EPA Method 8240

Sample Name	Lab Code	Percent Recovery		
		1,2-Dichloroethane - D_4	Toluene - D_8	4-Bromofluorobenzene
Method Blank	K945484-MB	99	104	95
GWCC-0994-02	K945484-002	100	103	95
GWCC-0994-3	K945484-003	102	99	96
	EPA Acceptance Criteria	76-114	88-110	86-115

Approved by Howard Boose Date 9/26/94

Columbia Analytical Services inc.
1317 South 13th Ave. • Kelso, WA 98626 • (206) 577-7222, FAX (206) 636-1068

CHAIN OF CUSTODY/LABORATORY ANALYSIS REQUEST FORM

DATE 9/8/94 PAGE 1 OF 1

PROJECT NAME McCall/GUCC # 0235007.05

PROJECT MNGR. Jim Maul

COMPANY/ADDRESS EMCON NW
Portland, OR

PHONE 624-7200

SAMPLERS SIGNATURE [signature]

ANALYSIS REQUESTED

SAMPLE I.D.	DATE	TIME	LAB I.D.	SAMPLE MATRIX	NUMBER OF CONTAINERS	Base/Neu/Acid Organics GC/MS 625/8270	Volatile Organics GC/MS 624/8240	Halogenated or Aromatic Volatiles 601/8010 ☐ 602/8020 ☐	Pesticides/PCBs 608/8080	Total Petroleum Hydrocarbons EPA 418.1 ☐ Oregon 418.1 ☐	TPH/Gas/BTEX 5030/8015/8020 Gas ☐ BTEX ☒	TPH/8015 Modified Diesel ☐ Hydrocarbon Scan ☐	TPH - HCID	TCLP Metals ☐ VOA ☐ Semi VOA ☐ Pest/Herb ☐	Metals (total or dissolved) List Below	Cyanide	pH, Cond, Cl, SO_4, PO_4, F, Br, NO_2, NO_3 (circle)	NH_3-N, COD, Total-P, TKN, TOC (circle)	Total Organic Halides (TOX) 9020			REMARKS
GUCC-0994-01	9/8/94	0930	115484-1	H_2O	4						X	X										
GUCC-0994-02		0950	-2		7		X				X	X										
GUCC-0994-03		1010	-3		3		X															
GUCC-0994-04		1100	-4		4						X	X										
GUCC-0994-05		1130	-5		4						X	X										
GUCC-0994-06		1200	-6		4						X	X										
Trip Blank	—	—			2						X											Didn't rec
Trip Blank	—	—			2		X															Didn't rec

RELINQUISHED BY:	RECEIVED BY:
[signature] Signature	Ruth Higley Signature
Bill Thorn Printed Name	Ruth Higley Printed Name
EMCON Firm	CAS Firm
9/8/94 1220 Date/Time	9/8/94 1400 Date/Time

TURNAROUND REQUIREMENTS:
___ 24 hr ___ 48 hr ___ 5 day
___ Standard (~ 10-15 working days)
___ Provide Verbal Preliminary Results
___ Provide FAX Preliminary Results
Requested Report Date ___

REPORT REQUIREMENTS
___ I. Routine Report
___ II. Report (includes DUP,MS, MSD, as required, may be charged as samples)
___ III. Data Validation Report (includes All Raw Data)
___ IV.CLP Deliverable Report

INVOICE INFORMATION:
P.O. # ___
Bill to: ___

SAMPLE RECEIPT:
Shipping VIA: Courier
Shipping #: Seal # 2996
Condition: ___
Lab No.: ___

RELINQUISHED BY:	RECEIVED BY:
Signature	Signature
Printed Name	Printed Name
Firm	Firm
Date/Time	Date/Time

SPECIAL INSTRUCTIONS/COMMENTS:

DISTRIBUTION: WHITE - return to originator; YELLOW - lab; PINK - retained by originator

400-05

APPENDIX C

FIELD SAMPLING DATA SHEETS

EMCON
Northwest, Inc.
15055 SW Sequoia Parkway, Suite 140 ● Portland, OR 97224
Office (503) 624-7200 ● FAX (503) 620-7658

* Duplicate *
Field Sampling Data

LOCATION/ADDRESS NW Front Ave
PROJECT NAME McCall/GWCC , 0235007.05
CLIENT/CONTACT Jim Mart

Well or Surface Site Number EX-1
Sample Designation GWCC-0994-02
Date, Time 9/8/94 0950
Weather Lt Rain

HYDROLOGY MEASUREMENTS:

(Nearest .01 ft.)	Elevation	Date, Time	Method Used (M-Scope Number or Other)
15.35		9/8/94 0733	S.I 15839

WELL EVACUATION:

Gallons	Pore Volumes	Method Used	Rinse Method	Date, Time
4.5+	3+	peri. pump	As Below	9/8/94 0950

Surface Water Flow Speed ______ Measurement Method ______ Date, Time ______

SAMPLING:

Sample	Date, Time	Method	Volume (ml)	Container Type	Depth Taken (feet)	Field Filtered (yes,no)	Preservative	Iced (yes,no)	Sampler Cleaning Method
8015M	9/8/94 0950	Disposable Bailer	1000	glass		N	HCl	Y	Non-Phosphatic detergent wash H2O rinse MeOH rinse Distilled H2O rinse
8020			3x40	glass		N	HCl		
8240			3x40	glass		N	HCl		

FIELD WATER QUALITY TESTS:

Pore Vol. Number	pH	Conductivity umhos/cm	Temp °C	Cond. @25°C	gal
1	4.53	1210	19.6		1.5
2	4.39	1270	19.6		3.0
3	4.37	1290	19.6	1437	4.5

NOTES:

Tagged Depth ≈ 24.1 − 15.35 = 8.75 × 0.163 = 1.42
Floating Product: NO
Description: Silty, No Noticeable odor

Duplicate for 8240 only: GWCC-0994-03 1010
WG-1 - below SG. at ≈ -5 0727

MW-1 17.30 0806	MW-4 16.35 0754	TMW-1 - 17.45 0814
MW-3 16.74 0801	MW-5 20.94 0748	TMW-2 - 17.42 0809

Total # of Bottles: 10 ~~10~~ ~~7~~ Signature: [signature]

SEA-400-01

EMCON
Northwest, Inc.
15055 SW Sequoia Parkway, Suite 140 ● Portland, OR 97224
Office (503) 624-7200 ● FAX (503) 620-7658

Field Sampling Data

LOCATION/ADDRESS: NW Front Ave
PROJECT NAME: McCall/GWCC #0235007.05
CLIENT/CONTACT: Jim Man

Well or Surface Site Number: Ex-2
Sample Designation: GWCC-0994-54
Date, Time: 9/8/94 1100
Weather: Lt Rain

HYDROLOGY MEASUREMENTS:

(Nearest .01 ft)	Elevation	Date, Time	Method Used (M-Scope Number or Other)
18.56		9/8/94 0725	S.I 15839

WELL EVACUATION:

Gallons	Pore Volumes	Method Used	Rinse Method	Date, Time
3+	3+	peri. pump.	As Below	9/8/94 1100

Surface Water Flow Speed ______ Measurement Method ______ Date, Time ______

SAMPLING:

Sample	Date, Time	Method	Volume (ml)	Container Type	Depth Taken (feet)	Field Filtered (yes,no)	Preservative	Iced (yes,no)
8015M	9/8/94 1100	Disposable Bailer	1000	glass		N	HCl	Y
8020			3x40	glass		N	HCl	

Sample: Cleaning Method
Non-Phosphatic detergent wash
H2O rinse
MeOH rinse
Distilled H2O rinse

FIELD WATER QUALITY TESTS:

Pore Vol. Number	pH	Conductivity umhos/cm	Temp °C	Cond. @25°C	gal
1	7.83	580	18.0		1.0
2	6.79	560	17.8		2.0
3	6.86	580	17.7	673	3.0

NOTES:

Tagged Depth ≈ 24.6 − 18.56 = 6.04 × 0.163 = 0.98
Floating Product: ND
Description: Clear, very slight chemical odor

Total # of Bottles: 4

Signature: [signature] 9/9/94

SEA-400-01

EMCON Northwest, Inc.

15055 SW Sequoia Parkway, Suite 140 ● Portland, OR 97224
Office (503) 624-7200 ● FAX (503) 620-7658

* Duplicate *
# Field Sampling Data

LOCATION/ADDRESS NW Front Ave
PROJECT NAME McCall/GWCC # 0235007.05
CLIENT/CONTACT Jim Maul

Well or Surface Site Number Ex-3
Sample Designation GWCC-0994-35
Date, Time 9/8/94 1130
Weather Lt Rain

HYDROLOGY MEASUREMENTS:

(Nearest .01 ft.)	Elevation	Date, Time	Method Used (M-Scope Number or Other)
17.96		9/8/94 0719	S.I 15839

WELL EVACUATION:

Gallons	Pore Volumes	Method Used	Rinse Method	Date, Time
3+	3+	peri. pump	As Below	9/8/94 1130

Surface Water Flow Speed ______ Measurement Method ______ Date, Time ______

SAMPLING:

Sample	Date, Time	Method	Volume (ml)	Container Type	Depth Taken (feet)	Field Filtered (yes,no)	Preservative	Iced (yes,no)
8015M	9/8/94 1130	Disposable Bailer	1000	glass		N	HCl	Y
8020			3X40	glass		N	HCl	

Sampler Cleaning Method: Non-Phosphatic detergent wash, H2O rinse, MeOH rinse, Distilled H2O rinse

FIELD WATER QUALITY TESTS:

Pore Vol. Number	pH	Conductivity umhos/cm	Temp °C	Cond. @25°C	gal
1	6.90	520	17.1		1.0
2	6.88	510	16.5		2.0
3	5.85	505	16.5	602	3.0

NOTES:

Tagged Depth ≈ 24.0 − 17.96 = 6.04 × 0.163 = 0.98
Floating Product: ND
Description: slightly cloudy gray, NO Noticeable odor.
* Duplicate = GWCC-0994-036 1200
↳ 8020 only?
There are 2 drums of soil at each well.
There is 1 drum (≈ 1/3 full) of purge water at each well!

Total # of Bottles: ~~7~~ 8

Signature: [signature]

SEA-400-01

EMCON Northwest, Inc.

15055 SW Sequoia Parkway, Suite 140 ● Portland, OR 97224
Office (503) 624-7200 ● FAX (503) 620-7658

Field Sampling Data

Well or Surface Site Number: EX-4
Sample Designation: GWCC-0994-01
Date, Time: 9/8/94, 0930
Weather: O. Rain

LOCATION/ADDRESS: NW Front Ave
PROJECT NAME: McCall/GWCC, # 0235007.05
CLIENT/CONTACT: Jim Rand

HYDROLOGY MEASUREMENTS:

(Nearest .01 ft.)	Elevation	Date, Time	Method Used (M-Scope Number or Other)
16.86		9/8/94 0741	S.I 15839

WELL EVACUATION:

Gallons	Pore Volumes	Method Used	Rinse Method	Date, Time
3.6+	3+	peri. pump.	As Below	9/8/94 0930

Surface Water Flow Speed: ______ Measurement Method: ______ Date, Time: ______

SAMPLING:

Sample	Date, Time	Method	Volume (ml)	Container Type	Depth Taken (feet)	Field Filtered (yes,no)	Preservative	Iced (yes,no)
8015M	9/8/94 0930	Disposable Bailer	1000	glass		N	HCl	Y
8020			3X40	glass		N	HCl	Y

Sample Cleaning Method: Non-Phosphatic detergent wash, H2O rinse, MeOH rinse, Distilled H2O rinse

FIELD WATER QUALITY TESTS:

Pore Vol. Number	pH	Conductivity (umhos/cm)	Temp (°C)	Cond. @ 25°C	gal
1	6.36	441	17.9		1.2
2	6.41	418	18.1		2.4
3	6.60	420	18.0		3.6

NOTES:

Tagged Depth ≈ 23.9 − 16.86 = 7.04 × 0.163 ≈ 1.15
Floating Product: NO
Description: Very rusty, No Noticeable odor
Calibrated pH & cond. meters

Total # of Bottles: 4

Signature: [signature]

SEA-400-01

Columbia Analytical Services inc.

1317 South 13th Ave. • Kelso, WA 98626 • (206) 577-7222, FAX (206) 636-1068

CHAIN OF CUSTODY/LABORATORY ANALYSIS REQUEST FORM

DATE 9/8/94 PAGE 1 OF 1

PROJECT NAME McCall/GWCC #0235007.05

PROJECT MNGR. Jim Maul

COMPANY/ADDRESS EMCON NW

Portland, OR

PHONE 624-7200

SAMPLERS SIGNATURE [signature]

ANALYSIS REQUESTED

SAMPLE I.D.	DATE	TIME	LAB I.D.	SAMPLE MATRIX	NUMBER OF CONTAINERS	Base/Neu/Acid Organics GC/MS 625/8270	Volatile Organics GC/MS 624/8240	Halogenated or Aromatic Volatiles 601/8010 □ 602/8020 □	Pesticides/PCBs 608/8080	Total Petroleum Hydrocarbons EPA 418.1 □ Oregon 418.1 □	TPH/Gas/BTEX 5030/8015/8020 Gas □ BTEX ☒	TPH/8015 Modified Diesel □ Hydrocarbon Scan □	TPH - HCID	TCLP Metals □ VOA □ Semi VOA □ Pest/Herb □	Metals (total or dissolved) List Below	Cyanide	pH, Cond, Cl, SO_4, PO_4, F, Br, NO_2, NO_3 (circle)	NH_3-N, COD, Total-P, TKN, TOC (circle)	Total Organic Halides (TOX) 9020			REMARKS
GWCC-0994-01	9/8/94	0930		H_2O	4						X	X										
GWCC-0994-02		0950			7		X				X	X										
GWCC-0994-03		1010			3		X															
GWCC-0994-04		1100			4						X	X										
GWCC-0994-05		1130			4						X	X										
GWCC-0994-06		1200			4						X	X										
Trip Blank	–	–			2						X											
Trip Blank	–	–			2		X															

RELINQUISHED BY:

[signature]
Signature

Bill Thorn
Printed Name

EMCON
Firm

9/8/94 1220
Date/Time

RECEIVED BY:

Signature

Printed Name

Firm

Date/Time

TURNAROUND REQUIREMENTS:

___ 24 hr ___ 48 hr ___ 5 day

___ Standard (~ 10-15 working days)

___ Provide Verbal Preliminary Results

___ Provide FAX Preliminary Results

Requested Report Date ___

REPORT REQUIREMENTS

___ I. Routine Report

___ II. Report (includes DUP,MS, MSD, as required, may be charged as samples)

___ III. Data Validation Report (includes All Raw Data)

___ IV.CLP Deliverable Report

INVOICE INFORMATION:

P.O. # ___

Bill to: ___

SAMPLE RECEIPT:

Shipping VIA Courier

Shipping # Seal # 1996

Condition: ___

Lab No.: ___

RELINQUISHED BY:

Signature

Printed Name

Firm

Date/Time

RECEIVED BY:

Signature

Printed Name

Firm

Date/Time

SPECIAL INSTRUCTIONS/COMMENTS:

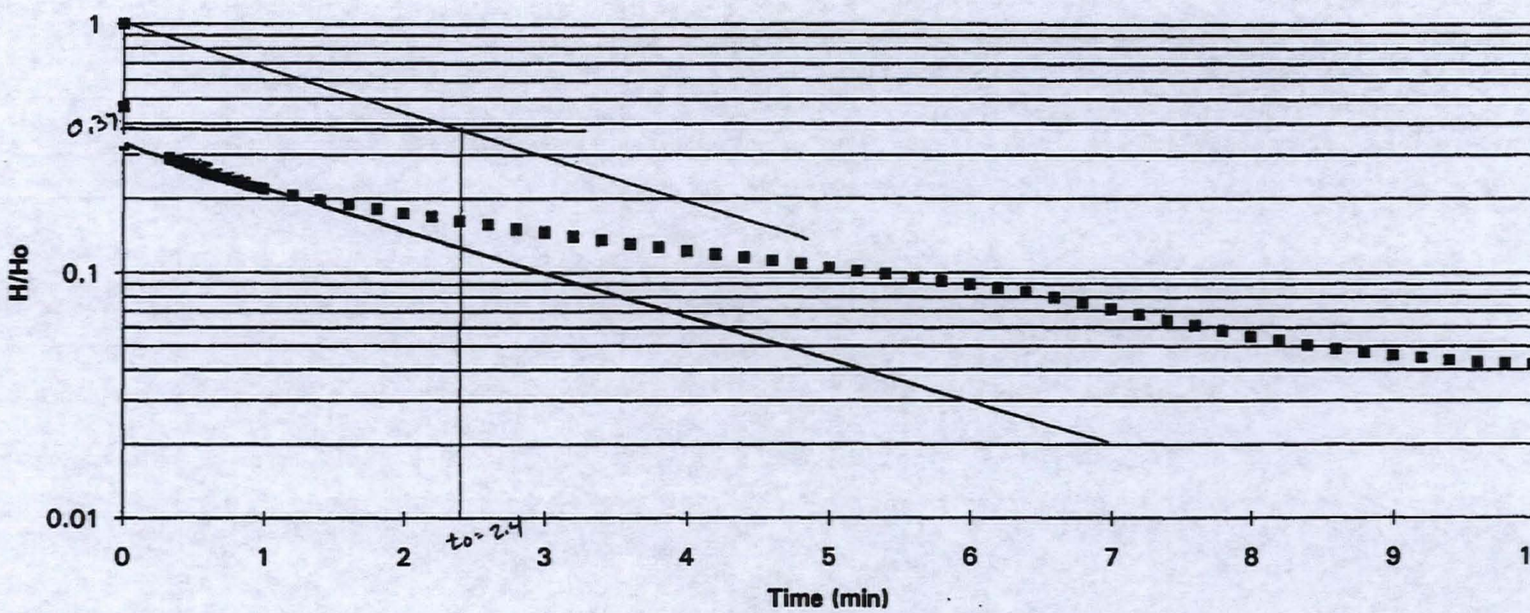
DISTRIBUTION: WHITE - return to originator; YELLOW - lab; PINK - retained by originator

400-05

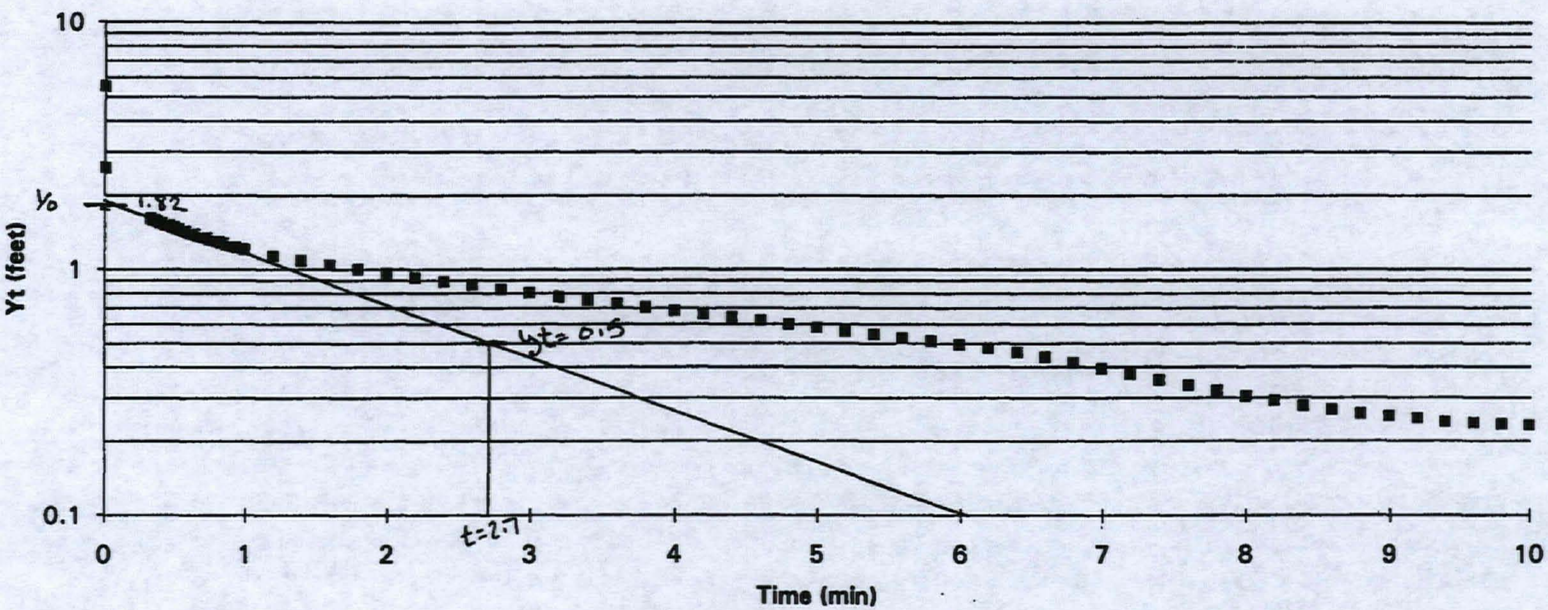
APPENDIX D

AQUIFER TEST DATA AND CALCULATIONS

McCall Oil/Great Western Chemical Company
EX-2
Hvorslev Analysis
H/Ho vs Time



McCall Oil/Great Western Chemical Company
EX-2
Bouwer and Rice Analysis
Yt vs Time



EX-2							
Rising Head Test							
SE1000C							
Environmental Logger							
09/29 12:02							
Unit# 01674 Test 1							
INPUT 1: Level (F) TOC							
Reference 0.000							
Linearity 0.050							
Scale factor 9.950							
Offset 0.010							
Delay mSEC 50.000							
Step 0 09/28 12:48:44							
Elapsed Time	INPUT 1		Hvorslev				
0	0.003		Corrected			Bouwer and Rice	
0.0033	3.796		Time	H/Ho		Time	Yt
0.0066	5.52		0	1		0	5.52
0.01	2.583		0.0034	0.467935		0.0034	2.583
0.0133	1.82		0.0067	0.32971		0.0067	1.82
0.0166	1.861		0.01	0.337138		0.01	1.861
0.02	1.88		0.0134	0.34058		0.0134	1.88
0.0233	1.883		0.0167	0.341123		0.0167	1.883
0.0266	1.886		0.02	0.341667		0.02	1.886
0.03	1.886		0.0234	0.341667		0.0234	1.886
0.0333	1.883		0.0267	0.341123		0.0267	1.883
0.0366	1.883		0.03	0.341123		0.03	1.883
0.04	1.88		0.0334	0.34058		0.0334	1.88
0.0433	1.877		0.0367	0.340036		0.0367	1.877
0.0466	1.874		0.04	0.339493		0.04	1.874
0.05	1.87		0.0434	0.338768		0.0434	1.87
0.0533	1.867		0.0467	0.338225		0.0467	1.867
0.0566	1.864		0.05	0.337681		0.05	1.864
0.06	1.861		0.0534	0.337138		0.0534	1.861
0.0633	1.858		0.0567	0.336594		0.0567	1.858
0.0666	1.855		0.06	0.336051		0.06	1.855
0.07	1.852		0.0634	0.335507		0.0634	1.852
0.0733	1.848		0.0667	0.334783		0.0667	1.848
0.0766	1.845		0.07	0.334239		0.07	1.845
0.08	1.839		0.0734	0.333152		0.0734	1.839
0.0833	1.836		0.0767	0.332609		0.0767	1.836
0.0866	1.833		0.08	0.332065		0.08	1.833
0.09	1.83		0.0834	0.331522		0.0834	1.83
0.0933	1.827		0.0867	0.330978		0.0867	1.827
0.0966	1.823		0.09	0.330254		0.09	1.823

0.1	1.817		0.0934	0.329167		0.0934	1.817
0.1033	1.814		0.0967	0.328623		0.0967	1.814
0.1066	1.811		0.1	0.32808		0.1	1.811
0.11	1.808		0.1034	0.327536		0.1034	1.808
0.1133	1.805		0.1067	0.326993		0.1067	1.805
0.1166	1.801		0.11	0.326268		0.11	1.801
0.12	1.798		0.1134	0.325725		0.1134	1.798
0.1233	1.792		0.1167	0.324638		0.1167	1.792
0.1266	1.789		0.12	0.324094		0.12	1.789
0.13	1.786		0.1234	0.323551		0.1234	1.786
0.1333	1.783		0.1267	0.323007		0.1267	1.783
0.1366	1.779		0.13	0.322283		0.13	1.779
0.14	1.773		0.1334	0.321196		0.1334	1.773
0.1433	1.77		0.1367	0.320652		0.1367	1.77
0.1466	1.767		0.14	0.320109		0.14	1.767
0.15	1.764		0.1434	0.319565		0.1434	1.764
0.1533	1.761		0.1467	0.319022		0.1467	1.761
0.1566	1.757		0.15	0.318297		0.15	1.757
0.16	1.754		0.1534	0.317754		0.1534	1.754
0.1633	1.751		0.1567	0.31721		0.1567	1.751
0.1666	1.745		0.16	0.316123		0.16	1.745
0.17	1.742		0.1634	0.31558		0.1634	1.742
0.1733	1.739		0.1667	0.315036		0.1667	1.739
0.1766	1.736		0.17	0.314493		0.17	1.736
0.18	1.732		0.1734	0.313768		0.1734	1.732
0.1833	1.729		0.1767	0.313225		0.1767	1.729
0.1866	1.726		0.18	0.312681		0.18	1.726
0.19	1.723		0.1834	0.312138		0.1834	1.723
0.1933	1.72		0.1867	0.311594		0.1867	1.72
0.1966	1.717		0.19	0.311051		0.19	1.717
0.2	1.714		0.1934	0.310507		0.1934	1.714
0.2033	1.71		0.1967	0.309783		0.1967	1.71
0.2066	1.707		0.2	0.309239		0.2	1.707
0.21	1.704		0.2034	0.308696		0.2034	1.704
0.2133	1.701		0.2067	0.308152		0.2067	1.701
0.2166	1.698		0.21	0.307609		0.21	1.698
0.22	1.698		0.2134	0.307609		0.2134	1.698
0.2233	1.695		0.2167	0.307065		0.2167	1.695
0.2266	1.692		0.22	0.306522		0.22	1.692
0.23	1.688		0.2234	0.305797		0.2234	1.688
0.2333	1.685		0.2267	0.305254		0.2267	1.685
0.2366	1.682		0.23	0.30471		0.23	1.682
0.24	1.679		0.2334	0.304167		0.2334	1.679
0.2433	1.676		0.2367	0.303623		0.2367	1.676
0.2466	1.673		0.24	0.30308		0.24	1.673
0.25	1.67		0.2434	0.302536		0.2434	1.67
0.2533	1.666		0.2467	0.301812		0.2467	1.666
0.2566	1.666		0.25	0.301812		0.25	1.666
0.26	1.663		0.2534	0.301268		0.2534	1.663

0.2633	1.66		0.2567	0.300725		0.2567	1.66
0.2666	1.657		0.26	0.300181		0.26	1.657
0.27	1.654		0.2634	0.299638		0.2634	1.654
0.2733	1.651		0.2667	0.299094		0.2667	1.651
0.2766	1.648		0.27	0.298551		0.27	1.648
0.28	1.645		0.2734	0.298007		0.2734	1.645
0.2833	1.641		0.2767	0.297283		0.2767	1.641
0.2866	1.641		0.28	0.297283		0.28	1.641
0.29	1.638		0.2834	0.296739		0.2834	1.638
0.2933	1.635		0.2867	0.296196		0.2867	1.635
0.2966	1.632		0.29	0.295652		0.29	1.632
0.3	1.629		0.2934	0.295109		0.2934	1.629
0.3033	1.626		0.2967	0.294565		0.2967	1.626
0.3066	1.626		0.3	0.294565		0.3	1.626
0.31	1.623		0.3034	0.294022		0.3034	1.623
0.3133	1.619		0.3067	0.293297		0.3067	1.619
0.3166	1.616		0.31	0.292754		0.31	1.616
0.32	1.613		0.3134	0.29221		0.3134	1.613
0.3233	1.61		0.3167	0.291667		0.3167	1.61
0.3266	1.61		0.32	0.291667		0.32	1.61
0.33	1.607		0.3234	0.291123		0.3234	1.607
0.3333	1.604		0.3267	0.29058		0.3267	1.604
0.35	1.591		0.3434	0.288225		0.3434	1.591
0.3666	1.579		0.36	0.286051		0.36	1.579
0.3833	1.566		0.3767	0.283696		0.3767	1.566
0.4	1.55		0.3934	0.280797		0.3934	1.55
0.4166	1.538		0.41	0.278623		0.41	1.538
0.4333	1.525		0.4267	0.276268		0.4267	1.525
0.45	1.513		0.4434	0.274094		0.4434	1.513
0.4666	1.5		0.46	0.271739		0.46	1.5
0.4833	1.488		0.4767	0.269565		0.4767	1.488
0.5	1.478		0.4934	0.267754		0.4934	1.478
0.5166	1.466		0.51	0.26558		0.51	1.466
0.5333	1.456		0.5267	0.263768		0.5267	1.456
0.55	1.444		0.5434	0.261594		0.5434	1.444
0.5666	1.434		0.56	0.259783		0.56	1.434
0.5833	1.425		0.5767	0.258152		0.5767	1.425
0.6	1.412		0.5934	0.255797		0.5934	1.412
0.6166	1.403		0.61	0.254167		0.61	1.403
0.6333	1.393		0.6267	0.252355		0.6267	1.393
0.65	1.384		0.6434	0.250725		0.6434	1.384
0.6666	1.375		0.66	0.249094		0.66	1.375
0.6833	1.365		0.6767	0.247283		0.6767	1.365
0.7	1.359		0.6934	0.246196		0.6934	1.359
0.7166	1.35		0.71	0.244565		0.71	1.35
0.7333	1.34		0.7267	0.242754		0.7267	1.34
0.75	1.331		0.7434	0.241123		0.7434	1.331
0.7666	1.321		0.76	0.239312		0.76	1.321
0.7833	1.315		0.7767	0.238225		0.7767	1.315

06		0.7934	0.236594		0.7934	1.306
6		0.81	0.234783		0.81	1.296
57		0.8267	0.233152		0.8267	1.287
1.277		0.8434	0.231341		0.8434	1.277
8		0.86	0.22971		0.86	1.268
58		0.8767	0.227899		0.8767	1.258
2		0.8934	0.226812		0.8934	1.252
3		0.91	0.225181		0.91	1.243
37		0.9267	0.224094		0.9267	1.237
7		0.9434	0.222283		0.9434	1.227
1		0.96	0.221196		0.96	1.221
5		0.9767	0.220109		0.9767	1.215
5		0.9934	0.218297		0.9934	1.205
3		1.1934	0.205254		1.1934	1.133
6		1.3934	0.196739		1.3934	1.086
42		1.5934	0.188768		1.5934	1.042
1.001		1.7934	0.181341		1.7934	1.001
3		1.9934	0.174457		1.9934	0.963
9		2.1934	0.168297		2.1934	0.929
		2.3934	0.161957		2.3934	0.894
		2.5934	0.156341		2.5934	0.863
		2.7934	0.150725		2.7934	0.832
		2.9934	0.145471		2.9934	0.803
5		3.1934	0.140399		3.1934	0.775
5		3.3934	0.13587		3.3934	0.75
5		3.5934	0.131341		3.5934	0.725
3		3.7934	0.127355		3.7934	0.703
1		3.9934	0.12337		3.9934	0.681
9		4.1934	0.119384		4.1934	0.659
64		4.3934	0.115942		4.3934	0.64
18		4.5934	0.111957		4.5934	0.618
9		4.7934	0.108514		4.7934	0.599
8		4.9934	0.105072		4.9934	0.58
2		5.1934	0.101812		5.1934	0.562
6		5.3934	0.098913		5.3934	0.546
7		5.5934	0.095471		5.5934	0.527
1		5.7934	0.092572		5.7934	0.511
6		5.9934	0.089855		5.9934	0.496
48		6.1934	0.086957		6.1934	0.48
61		6.3934	0.083514		6.3934	0.461
9		6.5934	0.079529		6.5934	0.439
17		6.7934	0.075543		6.7934	0.417
395		6.9934	0.071558		6.9934	0.395
3		7.1934	0.067572		7.1934	0.373
4		7.3934	0.06413		7.3934	0.354
36		7.5934	0.06087		7.5934	0.336
2		7.7934	0.057971		7.7934	0.32
4		7.9934	0.055072		7.9934	0.304
2		8.1934	0.052899		8.1934	0.292

8.4	0.279		8.3934	0.050543		8.3934	0.279
8.6	0.27		8.5934	0.048913		8.5934	0.27
8.8	0.26		8.7934	0.047101		8.7934	0.26
9	0.254		8.9934	0.046014		8.9934	0.254
9.2	0.248		9.1934	0.044928		9.1934	0.248
9.4	0.241		9.3934	0.043659		9.3934	0.241
9.6	0.238		9.5934	0.043116		9.5934	0.238
9.8	0.235		9.7934	0.042572		9.7934	0.235
10	0.232		9.9934	0.042029		9.9934	0.232
END							

Sweet-Edwards/EMCON, Inc.

COMPUTATION SHEET

PROJECT TITLE: McCall Oil / Great Western Chemical PROJECT NO. 0235007.09

DESCRIPTION: Slug Test Analyses EX-2 SHEET 1 OF 2

PREP. BY: KLH DATE: 10/94 CHKD BY: JK DATE: 10/21/94

Hvorslev

$\frac{A}{F}$ = shape factor

K = conductivity

d = diameter of casing = 0.167 ft

L = saturated length of screen = 6.03 ft

D = diameter of sand pack = 0.83 ft

T = basic time lag = 2.4 min

$$\frac{A}{F} = \frac{d^2 \ln\left[\frac{L}{D} + \sqrt{1 + \left(\frac{L}{D}\right)^2}\right]}{8L}$$

$$= \frac{(0.167\,ft)^2 \ln\left[\frac{6.03\,ft}{0.83\,ft} + \sqrt{1 + \left(\frac{6.03\,ft}{0.83\,ft}\right)^2}\right]}{8(6.03\,ft)} = \frac{0.0748}{48.2}$$

$$= 1.55 \times 10^{-3}\,ft$$

$$K = \frac{A}{FT} = \frac{1.55 \times 10^{-3}\,ft}{2.4\,min} = 6.47 \times 10^{-4}\,ft/min$$

$$= 3.3 \times 10^{-4}\,cm/sec$$

Sweet-Edwards/EMCON, Inc.

COMPUTATION SHEET

PROJECT TITLE: McCall Oil / Great Western Chemical PROJECT NO. 0235007.09

DESCRIPTION: Slug Test Analyses EX-2 SHEET 2 OF 2

PREP. BY: KLH DATE: 10/94 CHKD BY: JK DATE: 10/21/94

BOUWER AND RICE

K = conductivity

r_c = casing radius = 0.083 ft

L = length of saturated screen = 6.03 ft

r_w = sandpack radius = 0.417 ft

r_e = well's effective radius = 0.417 ft

Y_0 = initial drawdown = 1.82 ft

Y_t = vertical distance between water level at time t and equilibrium level = 0.5 ft

H = distance from H_2O table to bottom of screen = 6.03 ft

C = dimensionless coeff that is a function of L/r_w = 1.5

D = saturated aquifer thickness = 6.03 ft. assumed fully penetrating

t = time = 2.7 min

$L/r_w = 14.5$

$$\ln r_e/r_w = \left[\frac{1.1}{\ln(L_w/r_w)} + \frac{C}{L_e/r_w}\right]^{-1}$$

$$= \left[\frac{1.1}{\ln(6.03\text{ft}/0.417\text{ft})} + \frac{1.5}{(6.03\text{ft}/0.417\text{ft})}\right]^{-1} = 1.9$$

$$K = \frac{r_c^2 \ln(r_e/r_w)}{2L}\frac{1}{t}\ln\frac{Y_0}{Y_t}$$

$$= \frac{(0.083\text{ft})^2(1.9)}{2(6.03\text{ft})}\frac{1}{2.7\text{min}}\ln\frac{1.82\text{ft}}{0.5\text{ft}} = 5.2\times10^{-4}\text{ ft/min}$$

$$= 2.6\times10^{-4}\text{ cm/sec}$$

Sweet-Edwards/EMCON, Inc.

COMPUTATION SHEET

PROJECT TITLE: McCall Oil / Great Western Chemical PROJECT NO. 0235007.09

DESCRIPTION: Groundwater Table Velocity Calculations SHEET 1 OF 2

PREP. BY: KLH DATE: 10/94 CHKD BY: YK DATE: 10/21/94

Clean Sand - inland

$V = KI/n$

$K = 10^{-2}$ cm/sec (textbook value for clean sand)

I = gradient in cm/cm = 0.02 cm/cm

$n = 0.2$ (textbook value for clean sand)

$$V = \frac{(10^{-2}\text{ cm/sec})(.02\text{ cm/cm})}{(0.2)} = 1.0 \times 10^{-3}\text{ cm/sec}$$

$$= 1.97 \times 10^{-3}\text{ ft/min}$$

$$= 2.8\text{ ft/day}$$

clean Sand - river's edge

$K = 10^{-2}$ cm/sec (text book value for clean sand)

$I = 0.33$ cm/cm

$n = 0.2$ (text book value for clean sand.

$$V = \frac{(10^{-2}\text{ cm/sec})(0.33\text{ cm/cm})}{(0.2)} = 1.65 \times 10^{-2}\text{ cm/sec}$$

$$= 3.25 \times 10^{-2}\text{ ft/min}$$

$$= 47\text{ ft/day}$$

Sweet-Edwards/EMCON, Inc.

COMPUTATION SHEET

PROJECT TITLE: McCall Oil / Great Western Chemical PROJECT NO. 0235007.09

DESCRIPTION: Groundwater Table Velocity Calculations SHEET 2 OF 2

PREP. BY: KLH DATE: 10/94 CHKD BY: JK DATE: 11/21/94

Interbedded silt and sand (EX-2)

$V = KI/n$

$K = 2.6 \times 10^{-4}$ cm/sec , 3.3×10^{-4} cm/sec

$I = 0.33$ cm/cm

$n = .35$ (textbook value)

$$V = \frac{(2.6 \times 10^{-4} \text{ cm/sec})(0.33 \text{ cm/cm})}{(0.35)} = 2.45 \times 10^{-4} \text{ cm/sec}$$

$$= 4.8 \times 10^{-4} \text{ ft/min}$$

$$= 6.9 \times 10^{-1} \text{ ft/day}$$

or $$V = \frac{(3.2 \times 10^{-4} \text{ cm/sec})(0.33 \text{ cm/cm})}{(0.35)} = 3.02 \times 10^{-4} \text{ cm/sec}$$

$$= 5.9 \times 10^{-4} \text{ ft/min}$$

$$= 8.6 \times 10^{-1} \text{ ft/day}$$

PRELIMINARY ASSESSMENT OF McCALL OIL & CHEMICAL CORPORATION AND GREAT WESTERN CHEMICAL COMPANY

NW FRONT AVENUE PROPERTIES
PORTLAND, OREGON
ESCI ID #134

VOLUME 1 - TEXT

Prepared for

McCall Oil and Chemical Corporation

and

Great Western Chemical Company

April 5, 1994

Prepared by

EMCON Northwest, Inc.
15055 SW Sequoia Parkway, Suite 140
Portland, Oregon 97224

Project 0234-003.01

EMCON Northwest, Inc.

15055 SW Sequoia Parkway • Suite 140 • Portland, Oregon 97224 • **(503) 624-7200** • Fax (503) 620-7658

April 5, 1994
Project 0234-003.01

Mr. Lee R. Zimmerli
Great Western Chemical Company
808 S.W. 15th Avenue
Portland, Oregon 97205

Re: Preliminary Assessment Reports

Dear Lee:

Enclosed are two (2) copies of the final "Preliminary Assessment of McCall Oil & Chemical Corporation and Great Western Chemical Company, NW Front Avenue Properties, Portland, Oregon, ESCI #134" report for you to submit to the Oregon Department of Environmental Quality. The additional copies for McCall Oil and Chemical Corporation (McCall) and Great Western Chemical Company (GWCC), and Bogle & Gates will be delivered by the end of this week or early next week.

We appreciate the opportunity to assist McCall and GWCC with this project. Please call me if you have questions or require further assistance.

Sincerely,

EMCON Northwest, Inc.

James J. Maul, R.G.
Vice President and
Supervising Hydrogeologist

P/MCC/R1/LEE-CL.405-94/DP:0
0234-003.01

PRELIMINARY ASSESSMENT OF McCALL OIL & CHEMICAL CORPORATION AND GREAT WESTERN CHEMICAL COMPANY

NW FRONT AVENUE PROPERTIES
PORTLAND, OREGON
ESCI ID #134

VOLUME 1 - TEXT

Prepared for

McCall Oil and Chemical Corporation

and

Great Western Chemical Company

April 5, 1994

Prepared by

EMCON Northwest, Inc.
15055 SW Sequoia Parkway, Suite 140
Portland, Oregon 97224

Project 0234-003.01

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CONTENTS (Continued)

TABLES AND ILLUSTRATIONS

GENERAL SITE DATA
McCALL OIL AND CHEMICAL CORPORATION
PORTLAND, OREGON

Site Name and Address:	McCall Oil and Chemical Corporation 5480 NW Front Avenue Portland, Oregon 97210 Great Western Chemical Company, Portland Branch 5540 NW Front Avenue Portland, Oregon 97210 Great Western Chemical Company, Technical Center 5700 NW Front Avenue Portland, Oregon 97210
Current Land Owners:	Port of Portland (Tax lots #15, #24, #26, #27) GWC Properties, Inc. (Tax lot #17) McCall Oil and Chemical Corporation (Tax lot #96)
Current Operators:	McCall Oil and Chemical Corporation Great Western Chemical Company 808 SW 15th Avenue Portland, Oregon 97205
Site Contact:	Lee Zimmerli, Risk Manager McCall Oil and Chemical Corporation 808 SW 15th Avenue Portland, Oregon 97205 (503) 228-2600
Latitude:	45° 33′ 49″ N
Longitude:	122° 44′ 4″ W
Legal Description:	The site is located in the southwestern quarter of Section 18, Township 1 North and Range 1 East, and in the northwestern quarter of Section 19, Township 1 North, Range 1 East.
Directions to Site:	The site is approximately 3 miles northwest of downtown Portland, Oregon. From Portland, take Highway 30 (St. Helens Road) north to Kittredge Avenue. Turn right (northeast) onto Kittredge Avenue, then left (northwest) onto Front Avenue. Access to the facilities is approximately one-third mile along Front Avenue on the right.

INTRODUCTION

This report presents the results of a Preliminary Assessment (PA) for McCall Oil & Chemical Corporation (McCall) and Great Western Chemical Company (GWCC). Corporate offices for both companies are located in Portland, Oregon. At the request of McCall and GWCC, EMCON Northwest, Inc. (EMCON), conducted the PA between January 14, 1994, and April 1, 1994. The site location is shown on Figure 1.

The scope of the PA is consistent with the Oregon Department of Environmental Quality (DEQ) PA guidance (DEQ, 1992). The DEQ's PA guidance indicates that a PA applies to sites where a "significant threat to human health or the environment is suspected." The PA is designed to gather the historical information to consider whether the site is releasing, has released, or has the potential to release hazardous substances to the environment and whether a response action is appropriate.

In September 1993, the DEQ requested that McCall conduct a PA of its marine oil terminal in Northwest Portland, as part of DEQ's ongoing regional investigation of petroleum product contamination in the Willbridge industrial area of northwest Portland (DEQ, 1993). This request was subsequently expanded to include GWCC's chemical distribution and manufacturing facilities on the adjacent property. Area wide groundwater impacts resulting from the operations at several bulk petroleum terminal facilities and other industrial sites have been documented (Hart Crowser, 1993; SEACOR, 1993a and 1993b). Of particular concern to this study are petroleum impacts to groundwater along the northern boundary of the subject property.

As a general rule, a PA is conducted to identify potential hazards at a site and to establish site priorities for further study. The Scope of Work included: employee interviews; a review of available file information; an assessment of potentially impacted media; and a site tour. This PA is not intended to be a comprehensive investigation or characterization of the site. Specific information sources are listed in Table 1.

The property considered in this PA is currently occupied by two independent companies, McCall and GWCC. The companies conduct separate, unrelated operations on adjacent sites, and each site has its own ownership and operational history. Because there are two operating entities, the report format varies slightly from that presented in DEQ's PA guidance document. Part I of this report describes regional and site characteristics, and pathways of concern common to both sites. Part II describes the background, current operations, regulatory and site investigation history, and waste characteristics of the

McCall site. Part III provides similar information for the GWCC site. Summaries, conclusions, and recommendations are presented separately for each site.

PART I

GENERAL INFORMATION COMMON TO THE McCALL AND GWCC FACILITIES

1 BACKGROUND

1.1 Property Description

The site is located in the industrialized area of northwest Portland along NW Front Avenue (see Figure 1). It occupies approximately 36 acres on the southwest bank of the Willamette River. The site encompasses six tax lots. GWC Properties, Inc., a subsidiary of McCall, owns tax lot 17. McCall owns tax lot 96. The Port of Portland (Port) owns lots 15, 24, 26, and 27. GWCC occupies tax lot 17; McCall occupies tax lots 15, 24, 26, and 96 (see Figure 2). Prior to 1966, most of the land now included in lots 15, 24, and 26 was submerged beneath the Willamette River. The Port created new land along the Willamette during the mid-1960s by dredging and filling along the shore. This land, including a portion of the subject site, was deeded to the Port by the state of Oregon in 1967.

The property is currently occupied by three separate operating facilities: the McCall marine terminal and asphalt facility, the GWCC Technical Center facility (previously known as Chemax), and the GWCC Portland Branch facility (see Figure 3). Current and historical activities associated with the operations of each of these facilities is discussed in detail later in this report (see Parts II and III).

1.2 Surrounding Land Use

The site is included in the Willamette Greenway (Greenway) established by the City of Portland to monitor and control land use next to the river. The site and surrounding properties are zoned for heavy industrial use, both within the Greenway on the left bank (facing downriver) and outside of the Greenway (see Appendix A). Surrounding industries include: petroleum bulk distribution terminals, chemical plants, sand and gravel operations, a steel fabrication facility, shipyards, and rail yards. A comprehensive depiction and listing of surrounding land use is shown on Figure 4.

1.3 General Site History

In the mid-1920s the Port purchased the property now occupied by McCall and GWCC as part of an approximately 65-acre parcel that stretched from the lands owned by Union Oil Company of California (Unocal) on the west, to the Willamette River. Prior to the mid-1940s the property was vacant (see Appendix B). In 1946, Pioneer Flintkote Company (Flintkote) purchased two parcels from the Port, corresponding generally to present site tax lots 17 and 96 (see Figure 2). These tax lots are currently occupied by GWCC and the McCall asphalt plant, respectively.

Flintkote manufactured asphalt roofing shingles and tiles on the property from 1947 to approximately 1982. A factory, a warehouse for roofing material, silos, boilers, aboveground and underground storage tanks (ASTs and USTs, respectively), and retorts were situated on tax lot 17. Historical occupation records indicate that Standard Oil Company operated a distribution center at the address corresponding to adjacent tax lot 96 during the 1950s (SAFE, 1994). By 1960, Douglas Oil Company (Douglas) occupied this address, and operated an asphalt facility. In 1962, Douglas purchased tax lot 96 from Flintkote. Douglas and Flintkote continued to operate their respective facilities until 1982, when both parcels and the improvements were sold to McCall (see Figure 5). Erro Enterprises (Erro) purchased the asphalt facility from McCall in 1982 and operated the facility until 1992, when it was sold back to McCall. GWC Properties, Inc., now owns tax lot 17.

Chemax began operations on the former Flintkote site in early 1984. The Portland branch began its on-site operations in late 1985. In 1985, McCall operated a lube oil distribution facility on part of the asphalt plant site. The lube oil operations were discontinued in 1991.

In the early to mid-1960s, the Port used dredge spoils from the Willamette River channel (primarily fine sand) to create new land along the Willamette River next to the Flintkote and Douglas facilities. As stated previously, this land was subsequently deeded to the Port by the state of Oregon in 1967. In the mid-1970s, McCall constructed the marine terminal on the filled land (corresponding approximately to tax lots 15, 24, 26 and 27; see Figure 2). McCall distributes petroleum products, including diesel, bunker fuel, and asphalt, from the marine terminal. The marine terminal property is leased from the Port by McCall.

The site currently includes the GWCC Technical Center, the GWCC Portland Branch, and the McCall marine terminal and asphalt facility (see Figure 5). Site development from the 1930s to the present can be assessed by reviewing a series of aerial photographs presented in Appendices B and C. Details of McCall and GWCC operations are presented in Parts II and III of this report.

1.4 Willbridge Area Investigations

Many industrial facilities in the Willbridge area have undergone or are currently conducting studies to assess potential environmental impacts from their operations. Because groundwater impacts have been identified at facilities immediately adjacent to, and hydraulically upgradient of, the McCall and GWCC operations, the results of assessments at these facilities (Hart Crowser, 1993; SEACOR, 1993a, 1993b) need to be taken into account when evaluating potential impacts at the GWCC and McCall sites.

Since at least the early 1970s, floating petroleum hydrocarbon products have been found in the former 27-inch wood stave Doane Avenue storm sewer, which is located north of the McCall site, between the Willbridge terminals of Chevron U.S.A., Inc. (Chevron), and Unocal (SEACOR, 1993a and 1993b). The sewer was found to have cracks and deteriorated joints that allowed groundwater and hydrocarbons to infiltrate the sewer and discharge to the Willamette River at the sewer outfall.

To mitigate the effect of this contaminant discharge, Chevron created a containment area downstream of the sewer outfall by deploying a boom on the river (see Figure 6). Product accumulating behind the boom was recovered by Chevron until 1982. Between 1975 and the early 1980's, Chevron pumped accumulated product from a depression in the storm sewer where the piping dipped beneath Front Avenue. DEQ records indicate that approximately 9,000 gallons of petroleum product were recovered from the containment area between 1974 and 1978; an even greater volume was recovered from pumping the storm sewer depression under Front Avenue. Pumping continued until 1982, when the new Doane Avenue storm sewer was completed. The "old" sewer was filled with concrete. Subsequent to the abandonment, further petroleum product migration to the Willamette River reportedly ceased (SEACOR, 1993a).

DEQ records also indicate that there have been free petroleum hydrocarbon product discharges to the Willamette River from seeps along the bank just north of the McCall facility near the docks of Shell Oil Company (Shell), Chevron, and Unocal. In response to these releases, Chevron and Unocal conducted several assessments of the subsurface soils and groundwater in the area encompassed by the Willamette River, NW Front Avenue, the Chevron dock, and the Unocal dock. Petroleum hydrocarbons were encountered in the sandy dredge-spoil soils throughout the study area; floating product was encountered in groundwater monitoring wells (approximately 0.1 inch thickness) (IT, 1982).

In November 1982, an assessment concluded that the gravel backfill around the new Doane Avenue storm sewer acted as a major groundwater drain for the area, and could be a likely path for hydrocarbon migration (IT, 1982). Later studies confirmed that the new sewer had breached a naturally occurring silt dike that had formerly acted as a bank of the former Kittridge Lake (RES, 1985). The breach created by the new sewer allowed hydrocarbons to migrate via the coarse sewer backfill to the river. As much as 6 feet of petroleum product was measured in a monitoring well installed next to, and possibly within, the storm sewer backfill, at the intersection of NW Front Avenue and NW Doane Avenue (SEACOR, 1993a) (see Figure 6). In 1987, a clay barrier was constructed along the new storm sewer to aid in hydrocarbon recovery. Following installation of the barrier, hydrocarbon recovery from wells along the sewer increased; no further seepage was observed at the sewer outfall (SEACOR, 1993a).

However, further assessment indicated that hydrocarbon product continued to follow a pre-fill drainage channel to the river. Chevron and Unocal installed a trench at the beach line between their docks to intercept the hydrocarbons migrating along the channel; a wet well was also installed to recover product trapped behind the intercept trench (SEACOR, 1993a).

The Chevron and Unocal assessments concluded that the primary hydrocarbon component associated with the floating product was number (no.) 2 diesel fuel. Gasoline was detected next to Unocal's gasoline tank farm; fuel oil was detected at the southwest end of Chevron's main tank yard (SEACOR, 1993a).

Migration of the hydrocarbon plume generally follows the local groundwater gradient. As shown on Figure 6, the new storm sewer continues to influence groundwater flow direction. The downgradient two-thirds of the plume follows NW Doane Avenue and the new sewer system, while the upgradient third of the plume extends to the east and west across the southern corner of the Chevron main tank yard (see Figure 6). The extent of floating product migration onto surrounding properties has not been defined. Petroleum hydrocarbon recovery by Chevron and Unocal continues in three areas adjacent to the McCall facility: the intercept trench well, the area along the new storm sewer clay barrier, and the recovery well at the intersection of NW Front and NW Doane avenues (SEACOR, 1993a and 1993b) (see Figure 6).

The Shell Willbridge Terminal is situated northwest of the site. The facility adjoins Chevron's main tank yard to the north. Organic and inorganic constituents have been detected in soil and groundwater samples collected at the site. These constituents include metals, benzene, toluene, ethylbenzene, xylenes, polynuclear aromatic hydrocarbons (PAHs), and total petroleum hydrocarbons (TPH) as gasoline and diesel. Floating product also has been measured on groundwater beneath the site (Hart Crowser, 1993). Soil at the site apparently continues to be a source of groundwater impacts, particularly within Shell's south tank yard (Hart Crowser, 1993).

A number of factors may influence groundwater flow beneath the Shell site (see Figure 6). An apparent groundwater mound is present beneath the south tank yard and warehouse areas. The mounding may be the result of leaks in the drainage system. Groundwater extraction activities at the adjacent Chevron terminal appear to have steepened the groundwater gradient along the eastern perimeter of Shell's south tank yard. Extraction activities also appear to have influenced the flow direction in that area.

Preferred migration pathways may be provided via a number of ancestral channels of Saltzman Creek, which would have been filled with coarse-grained material as the creek shifted its path. The concrete flume currently enclosing Saltzman Creek may act as a barrier to groundwater flow, although the effect does not appear to be significant (Hart Crowser, 1993).

There is no evidence that constituents present in groundwater at the Shell terminal have impacted the Willamette River, or that there has been significant off-site migration of constituents as a result of groundwater impacts at the Shell site (Hart Crowser, 1993).

In summary, the extent of floating hydrocarbon product from the Chevron and Unocal facilities onto surrounding properties, including the McCall and GWCC sites, has not been defined. Although there are documented releases to groundwater from operations at the Shell facility, these releases are not reported to have migrated off the Shell site.

2 GROUNDWATER PATHWAY

2.1 Hydrogeologic Setting

McCall and GWCC are situated on the floodplain of the Willamette River, approximately 8 miles upstream of the confluence with the Columbia River (see Figure 1). The Willamette River channel and floodplain near Portland occupy the western margin of the Portland basin, which is bounded by the northeastern flank of the Tualatin Mountains. The region is underlain by unconsolidated Holocene age river deposits of silt, sand, and organic rich clay, with lesser amounts of gravel. These deposits pinch out against the base of the Tualatin Mountains to the west, reaching thicknesses of up to approximately 150 feet near the banks of the Willamette River.

The Holocene age sediments are underlain by conglomerates of the early Pliocene age Troutdale formation, siltstone of the early Pliocene age Sandy River formation, and the Miocene to Pliocene age Columbia River Basalt. The surrounding foothills and mountain ridges consist primarily of Tertiary age volcanic and sedimentary rocks (Beeson et al., 1991).

The principal aquifers underlying the west Portland area occur within the Troutdale formation and Columbia River Basalt. The unconsolidated Holocene river deposits also serve as less important water bearing units where they extend below the water table. The most productive aquifer in the region is situated within the conglomerates of the Troutdale formation. The fine-grained, relatively impermeable Sandy River mudstones form an effective barrier to vertical groundwater movement, restricting groundwater flow between the overlying Troutdale formation and the underlying Columbia River Basalt. The upper portion of the Columbia River Basalt is fractured and porous; thus, it is also an important regional aquifer (Brown, 1963).

Recharge of groundwater to the aquifers underlying the west Portland area occurs primarily by infiltration from precipitation and surface runoff. Discharge from the regional aquifers is primarily by seepage to major bodies of surface water and withdrawal of groundwater from wells. Regional groundwater movement is generally to the north-northeast, toward the Willamette River (Brown, 1963).

2.1.1 Site Geology and Hydrology

The Willbridge industrial area, including the site, is situated on fill dredged from the Willamette River. The dredged sediments were used to fill lakes in the area from the early 1900s to the 1940s. The upper 20 to 35 feet of sediments beneath the site and the surrounding vicinity consist of fine- to medium-grained silty, sandy dredge-spoils. The fill layer is generally homogeneous, with some silt and clay lenses. The unconfined groundwater within the fill is reportedly 8 to 10 feet in average thickness. The fill overlies the original surface of lake bottom sediments, marsh silts, and alluvial silts and silty clays. Beneath the site, the alluvium is encountered at approximately 20 feet below ground surface (bgs), and is characterized by interbedded gray silt and clay with lesser amounts of sand (EMCON, 1994). The McCall marine terminal is situated on more recently dredged silty, sandy fill material, overlying alluvial silts and clays. Cross sections of the site provide a general illustration of the site geology (see Figures 6 and 7).

Depth to groundwater varies seasonally from 15 to greater than 20 feet bgs. The direction of shallow groundwater flow beneath the site varies from the northwest to the northeast depending on the proximity to the Willamette River. The average gradient is 0.007 foot per foot (ft/ft) (EMCON, 1994). The groundwater flow direction in the vicinity of the site also varies from northwest to northeast, and is influenced by subsurface features such as ancestral stream channels, silty lake deposits, ancestral basins, and storm sewers (see Figure 6).

Using the average gradient of 0.007 ft/ft (EMCON, 1994), a typical porosity for fine to medium sand (30 percent), and a typical hydraulic conductivity of 10 gallons per day per square foot (Freeze and Cherry, 1979), the flow velocity within the shallow saturated fill beneath the site is estimated at approximately 11 feet per year. This estimate differs significantly from the flow velocity of 300 to 400 feet per year estimated for the Chevron and Unocal sites (SEACOR, 1993a, and 1993b) and the Shell site (Hart Crowser, 1993). In these estimates, the hydraulic conductivity assumed for unconsolidated silty sand was 35 feet per day. This value, while possible, appears to be unusually high considering the fine-grained nature of typical dredge spoil sediments and the likely degree of soil compaction supporting the structures and tanks in the industrial area.

2.1.2 Annual Net Precipitation

The average annual net precipitation for the Portland area is approximately 12 inches per year, based upon an average annual precipitation of 37.39 inches minus the annual evapotranspiration of approximately 25 inches (NOAA, 1982).

2.2 Groundwater Targets

The crest of the Tualatin Mountains, west of the site, is considered a hydraulic boundary, as is the Willamette River, to the northeast. According to registered well logs, four industrial wells are located between these hydraulic boundaries and within 1 mile of the site (see Table 2). The closest industrial well is on the Chevron site, upgradient of the McCall and GWCC site. Two wells were drilled by the Penn Salt Company in 1949 and 1953. Information about their purpose, location, and present status is unavailable. There are no identified domestic wells or well fields within 1 mile of the site. According to the Oregon State Water Resources Department, the only producing well field in the Portland area used for municipal water supply is the Portland Columbia South Shore Well Field. This well field is located on the south shore of the Columbia River, upstream of the confluence with the Willamette River, about 8 miles east-northeast of the site (Papadopulos, 1993).

2.3 Groundwater Summary

EMCON's review of the geologic and hydrogeologic data available for the site and surrounding area indicate that the migration pathway of groundwater originating below the site is to the north-northeast and that groundwater discharges to the Willamette River. Groundwater findings are summarized below:

- The crest of the Tualatin Mountains, located west of the site, and the Willamette River, located northeast of the site, are considered hydraulic boundaries.
- The site is underlain by saturated dredge spoils. The saturated thickness of these sediments is less than 10 feet.
- Shallow groundwater in the saturated dredge spoil sediments discharges to the Willamette River.
- Extensive impacts to shallow groundwater have been identified at bulk petroleum storage facilities upgradient and crossgradient of the site (Hart-Crowser, 1991; SEACOR, 1993a and 1993b)
- Native fine-grained sediments restrict the vertical migration of groundwater from the saturated dredge spoils into deeper aquifers.
- There is a public water supply that provides water to the area.
- There are no domestic groundwater wells or municipal well fields within 1 mile downgradient of the site.

- There is no documented beneficial use of groundwater from the shallow saturated dredge spoils.

- There is no documented industrial groundwater use within 1-mile downgradient of the site. The nearest well is located at the Chevron facility, upgradient of the McCall site.

- Groundwater in the area flows from the northwest to the northeast and discharges to the Willamette River. Groundwater will be substantially diluted upon mixing with water from the river.

- No endangered, threatened, or species of special concern are known to reside in the area (see Appendix D).

2.4 Groundwater Conclusions

The geologic and hydrogeologic evidence indicates that the migration path of groundwater beneath the site varies from the northwest to the northeast. Groundwater discharges to the Willamette River. Since the site borders the river, there is no opportunity for downgradient use of the shallow groundwater. Consequently, the potential recipients of groundwater from beneath the site are targets located in the Willamette River.

Recent groundwater monitoring at the site has detected low concentrations of chemical substances in groundwater. However, the volume of groundwater that enters the river is expected to be a small fraction of the volume of water that flows past the site and concentrations of chemical substances in shallow groundwater will be substantially reduced upon discharge to the river. Therefore, there is no indication that groundwater currently poses a threat to human health or the environment.

3 SURFACE WATER PATHWAY

3.1 Hydrologic Setting

The site overlies dredge spoils taken from the Willamette River. Dredge spoils were used to fill lakes and lowlands between the Tualatin mountains and the Willamette River from the early 1900s through the 1960s. The site is essentially flat, sloping gradually to the northeast toward the Willamette River. The majority of the site lies outside the 500-year floodplain of the Willamette River with the exception of a small portion of land in the northeast corner of the property (NFIP, 1986). The maximum 2-year, 24-hour rainfall event is 2.5 inches (DEQ, 1991).

No surface water bodies exist at the site. The primary bodies of surface water within 2 miles downgradient of the site include three remnants of Doane Lake, Saltzman Creek, and the Willamette River (see Figure 8). Three remnants of Doane Lake are located approximately 1.0 to 1.5 mile northwest of the site and hydraulically cross-gradient of the site. The surface areas of East Doane Lake, West Doane Lake, and North Doane Lake are 3.5, 1.0, and 3.5 acres, respectively. Each lake receives surface runoff from immediately adjacent areas. No runoff from the site reaches the Doane lakes.

Saltzman Creek, which flows through the middle of the Shell Willbridge Terminal, is located approximately 0.5 mile northwest of the site. Saltzman Creek collects runoff from a drainage area of approximately 840 acres along the east slope of the Tualatin mountains (City of Portland, 1991). The creek is enclosed in a concrete culvert over the distance of the Shell Willbridge facility and daylights adjacent to the Willamette River. The average annual stream flow for Saltzman Creek is between 3 and 4 cubic feet per second (Hart Crowser, 1993). No runoff from the McCall and GWCC sites reaches Saltzman Creek.

Seven wetlands were identified along the Willamette River within 2 miles downriver from the site (USFWS, 1981), including the following (see Figure 9):

- (1) Palustrine; unconsolidated bottom; permanently flooded; excavated ($PUBH_x$)
- (1) Palustrine; unconsolidated bottom; artificially flooded; artificial substrate ($PUBK_r$)

* (1) Palustrine; unconsolidated shore; artificially flooded; artificial substrate (PUSK$_r$)
* (2) Riverine; tidal; unconsolidated shore; regularly flooded (RISUN)
* (1) Riverine, upper perennial, unconsolidated bottom; permanently flooded (R3UBH)

The Willamette River forks approximately 3.5 miles downriver from the site at Sauvie Island, creating the Multnomah Channel. The Willamette and Columbia River confluence is approximately 8.0 miles downriver from the site. The Multnomah Channel confluence with the Columbia River is approximately 17.5 miles downriver from the site.

Stormwater discharges from both facilities are regulated under National Pollutant Discharge Elimination (NPDES) permits issued by the DEQ. The stormwater from the oil-water separator is sampled weekly for pH and oil and grease in accordance with NPDES permit 1300-J. Oil is periodically removed from the oil-water separator for off-site fuels blending. GWCC monitors stormwater collected in the sump as per the requirements of NPDES permit 1200-H.

Percolation and ponding of stormwater occurs within unpaved or gravel-paved areas throughout the site (see Figure 9). Stormwater runoff at the gravel-paved marine terminal tank farm flows to several stormwater catch basins within the tank farm, at the truck loading rack, and the asphalt plant loading rack; runoff is discharged to the American Petroleum Institute (API) oil-water separator west of the McCall office. The stormwater collection system is equipped with valves to regulate discharge to the oil-water separator, thereby avoiding system overflow. Stormwater runoff from the northwestern portion of the GWCC site flows to an asphalt-lined drainage ditch along the northern side of the facility. The drainage ditch connects to a concrete catch basin that discharges to the Willamette River. The catch basin is equipped with a shut-off valve at the discharge piping to contain inadvertent releases of hazardous substances in the catch basin before they could discharge to the Willamette River.

3.2 Surface Water Targets

Surface water located within 2 miles of the McCall and GWCC site is used for public recreation, commercial and industrial activities, and fishing. A public boat launch is located on the Willamette River approximately 2.5 miles downriver of the site, immediately west of St. John's Bridge. Two industrial surface water intakes are also located downriver of the site. The first, by Elf Atochem North American, Inc., is approximately 0.5 miles downriver. The second is located approximately 3.0 miles downriver of the site; the water is apparently used for a chemical reactor operated by West Coast Adhesives Company. Lone Star Northwest, the adjacent upriver site, also has an industrial water intake from the river (SAFE, 1994). There are no intakes downriver of the site used for potable water supplies.

The Willamette and Columbia Rivers are migratory routes for several anadromous fish species, including salmon, steelhead, and American shad (ODFW, 1992b) (see Appendix D). No endangered, threatened, or species of special concern are known to reside in the area (ODFW, 1992a) (see Appendix D).

3.3 Surface Water Summary

Surface water findings are summarized below:

- The Willamette River is the only surface water body that could receive runoff or groundwater discharge from the site.
- Surface water runoff (i.e., stormwater) is controlled and monitored according to the requirements of an NPDES permit.
- Although groundwater flows north-northeast toward and interfaces with the Willamette River, the volume of groundwater that enters the river is expected to be a small fraction of the volume of water that flows past the site.
- There is one industrial water intake within 2 miles downstream on the Willamette River. The river is not used as a source of potable water downgradient of the site.
- No endangered, threatened, or species of special concern are known to reside in the area (see Appendix D).

3.4 Surface Water Conclusions

The two primary routes by which chemical substances could reach the surface water pathway are through surface runoff and groundwater discharge. Surface water runoff is controlled by a series of catch basins and drainage channels, except for minor infiltration of rainwater on the unpaved strip of land between the McCall and GWCC sites. It is routed to either an oil-water separator or to a containment structure. Discharge of surface runoff is regulated by NPDES permits for both the McCall and GWCC sites. Therefore, surface water discharge poses no threat to human health or the environment.

The potential for chemical substances in groundwater to reach the surface water pathway is discussed above in Section 2.4. The impact of any substances possibly in groundwater would be substantially reduced upon discharge of groundwater to the Willamette River. Therefore, groundwater quality poses no threat to human health or the environment via the surface water pathway.

4 AIR PATHWAY

4.1 Physical Conditions

Meteorological data was obtained from the former DEQ meteorological station at Standard Oil approximately 0.25 mile southwest of the site and the National Oceanic and Atmospheric Administration's (NOAA) weather service station located at the Portland International Airport National Climatic Center. Meteorological data for February 1977 through August 1980 obtained from the Standard Oil meteorological station is considered representative of weather conditions in the site area because of the proximity of the station to the site.

Wind directions at the site are influenced by the Tualatin Mountains west and tend to be west-southwest along the Willamette River. A wind frequency distribution graph (see Figure 10), developed using data from the Standard Oil wind monitoring station, depicts the direction and average wind speed in the vicinity of the site from February 5, 1977, through August 29, 1980. The mean wind speed was 4.4 mph during the operational period of the Standard Oil station. Mean wind speed at the Portland International Airport varies from approximately 5.5 mph during September and October to 9.0 mph during January. The annual mean wind speed is 6.8 mph (NOAA, 1977).

The annual average maximum daily temperature in the Portland area is 62°F. On average, only 10 days per year experience maximum daily temperatures greater than 90°F. Maximum daily temperatures average from 79.5°F in July to 44.4°F in January. On average, the maximum daily temperature is less than 32°F only 4 days each year (NOAA, 1977).

The primary mechanisms for substances to reach the air pathway are emissions from the operation of the boilers at the McCall asphalt plant and the marine terminal; particulate dust emissions from vehicular traffic on gravel-paved roads; the volatilization of organic compounds stored at the site from the product storage tank pressure relief vents; muriatic acid vapors from the drumming area at the GWCC facility; and incidental releases of hazardous substances.

Emissions from the boilers at the asphalt plant are permitted under DEQ Air Contaminant Discharge Permit No. 26-3058. The dispersion of airborne dust from areas previously impacted by spills is minimized by cleanup activities undertaken at the time of the release and a covering of gravel or pavement over exposed ground surfaces. According to information obtained during employee interviews, spilled chemicals (e.g., asphalt and bunker fuel) were recovered immediately, and residual impacted soil or gravel was removed. The majority of documented spills involved petroleum products that are either solid at normal temperatures and pressures (e.g., asphalt) or viscous heavy petroleum hydrocarbons (e.g., bunker fuel) with low mobility and volatility, as well as high flash points (see Table 7).

4.2 Air Pathway Targets

The site is bordered on the northeast by the Willamette River, to the south by Tube Forgings of America and Lonestar Northwest (formerly occupied by Oregon Steel), to the west by the Chevron and Unocal bulk petroleum terminals, and to the north by marine docks operated by Unocal, Chevron, and Shell (see Figure 4). Residential single-family dwellings are located approximately 0.5 miles west of the site on the west side of St. Helens Road. The primary land use within a 0.5-mile radius of the site is industrial (see Appendix A).

4.3 Air Summary

Air pathway findings are summarized below:

- The soil is covered by asphalt, gravel, and structures (e.g., buildings, tanks), which precludes or reduces any emissions from potentially impacted soil.

    - The majority of documented spills involved substances with low mobility and volatility, as well as high flash points.

    - Because the wind speed in the area averages approximately 4.4 mph, substances released to the air would be rapidly dispersed.

    - The site is located within an industrialized area.

4.4 Air Conclusion

The potential for exposure to chemical substances through the air pathway is reduced by the asphalt, gravel and structures covering the site. Surrounding target populations are small. Consequently, the air pathway does not represent a threat to human health or the environment.

5 DIRECT CONTACT

5.1 Physical Conditions

Potential sources available for direct contact would be those sources in soil and groundwater resulting from historical releases at the site. Since much of the site is covered by buildings, pavement, or gravel, direct contact with potential source areas is limited. Consequently, potential sources of direct contact (i.e., dermal contact with soil and incidental soil ingestion) are limited to principally aboveground product releases as a result of failure of a product containment or pipeline, or inadvertent dripping or spilling during normal operations. Site workers are trained in health and safety procedures and hazardous materials use and handling practices. The facility is surrounded by fencing or bordered by the Willamette River, which restricts access to the facility by nonauthorized personnel. Entry to the site after normal business hours is restricted by gates and security personnel.

5.2 Direct Contact Targets

The nearest residence is located 0.5 mile from the site. No nursing homes, schools, or hospitals are located within 1 mile of the site. The development of these types of facilities is unlikely given the heavy industrial and heavy industrial river zoning designations by the City of Portland (see Appendix A). Since access to the site by nonauthorized personnel is restricted, targets of the potential direct contact sources are limited to industrial workers on the site, including maintenance workers, public utility workers, and construction contractor workers. Direct contact with soil is minimized because the site is mostly covered by asphalt, gravel, or buildings. Further, the tank areas and material handling areas have secondary containment.

5.3 Direct Contact Summary

Direct contact findings are summarized below:

- No releases of chemical substances have occurred outside the facility property line with the exception of minor releases of asphalt or oil to the Willamette River during barge loading operations.

- Current spills are incidental and localized. They result from normal operations and procedures (e.g., valves, gaskets, and pipe fittings). These spills are localized and cleaned up routinely.

- The site is predominantly covered by asphalt, gravel, and structures (e.g., buildings, tanks).

- A site fence (and the Willamette River) discourages and limits access to the site.

- There is surveillance by security personnel after hours which restricts access to authorized personnel.

- No endangered, threatened, or species of special concern are known to reside in the area (see Appendix D).

5.4 Conclusions

Current information does not indicate that releases of chemical substances have occurred outside the facility boundaries in areas accessible to the public. The potential for direct contact by on-site workers exists; however, potential risks to workers are reduced by the use of appropriate health and safety practices and surface covers. Consequently, the direct contact pathway does not present a threat to human health or the environment.

PART II

McCALL OIL & CHEMICAL CORPORATION

1 INTRODUCTION

Part II of this report discusses the history, operations, and waste management practices of the McCall marine terminal and asphalt plant, identifies potential hazards; and discusses pathways of concern. The scope of this PA included a review of available file information, interviews with former and current employees, and a reconnaissance tour of the facility. EMCON requested that McCall review its files and provide EMCON relevant documents and information. EMCON subsequently reviewed this information. Information from employee interviews is not individually cited in the following narrative. Table 3 lists titles and dates of employment for each employee who participated in the interview process.

2 BACKGROUND

2.1 Site Description

Operations on the McCall site include a marine terminal and an asphalt plant (see Figure 11). The facility stores, blends, and distributes petroleum products including asphalt, bunker fuel, and diesel fuel. Bulk petroleum products are stored in ASTs at the marine terminal tank farm and at the asphalt plant. AST capacities and contents are summarized in Table 4.

The marine terminal has operated since 1975 and includes the marine dock, ASTs, the truck loading rack, an equipment maintenance storage shed, and offices. McCall has operated the asphalt plant since 1982. The asphalt plant includes ASTs, railcar and truck loading racks, boilers, and a product testing laboratory.

2.2 Ownership and Operational History

2.2.1 Ownership History

Flintkote purchased the property now occupied by the asphalt plant from the Port of Portland in 1946. In 1962, Douglas purchased the property from Flintkote. McCall purchased the property in 1982; the property was sold to Erro the same year. Erro sold the property back to McCall in 1992 (see Table 5).

The Port owns the land currently occupied by the marine terminal. As stated previously, this land was created by filling with dredge spoils along the Willamette River during the mid-1960s. The filled land was deeded to the Port by the State of Oregon in 1967 (see Table 5).

2.2.2 Operational History

Marine Terminal. Photographs of the McCall facilities taken during EMCON's PA site tour on January 4, 1994, are presented in Appendix E to supplement the following discussion. The McCall marine terminal and the asphalt plant are discrete operational areas. McCall constructed the marine terminal in 1974 and began on-site operations in

1975. Initially, the facility was used as a common terminal for McCall, Crown Zellerbach, and Boise Cascade. Since the beginning, the marine terminal operations included:

- Receiving petroleum products at the marine dock
- Receiving petroleum product via the Olympic pipeline
- Storing petroleum products at the marine terminal tank farm
- Distributing (i.e., dispensing) petroleum products at the marine dock and the truck loading rack
- Transferring petroleum products from the marine terminal to the asphalt plant

Stormwater collected in the tank farm, runoff from the parking lot, and material collected in sumps on the dock and in the loading area is directed to an API oil-water separator. The sludge in the separator is removed to a tank. Water from the tank is discharged, via the oil-water separator, to the river according to NPDES permit requirements.

Asphalt Plant. The asphalt plant has been on the site since the 1950s. The facility has been operated by Standard Oil Company (mid-to late- 1950s), Douglas (late 1950s to 1982), and McCall (1992 to present). The facility historically received, stored, blended, and distributed roofing grade and paving grade asphalt. Based upon available information provided by current and former site personnel, historical operations conducted at the asphalt plant included:

- Receiving and storing asphalt products
- Blending asphalt to customer specifications
- Operating boilers to heat asphalt storage tanks
- Distributing and dispensing products at the truck rack
- Receiving products by railcar
- Operating a product testing laboratory
- Receiving petroleum product via the Chevron subgrade pipeline
- Receiving petroleum product at the marine dock

The asphalt plant received product from the Chevron facility southwest of the site via a subgrade 6-inch pipeline, which was installed beneath Front Avenue in 1957 and replaced in 1991. The pipeline, which was used exclusively for asphalt products, passed periodic hydrotesting and has had no known ruptures. The pipeline was replaced in 1991 with a 6-inch product line inside 14-inch secondary containment piping. Douglas operations included product modification operations (i.e., blending, air-blowing) to meet customer (e.g., Flintkote) specifications. Asphalt was stored in aboveground 10,000 barrel (bbl) storage tanks (tank numbers 19, 20, and 21) (see Figure 11) along with other ancillary smaller capacity ASTs. An AST was formerly situated on the unpaved strip of land east of the former Douglas facility (see Appendix B). The contents of the tank are unknown. Douglas manufactured medium cure products containing kerosene distillates, rapid cure products containing petroleum naphthalene, and stove oil. A small product testing laboratory conducted primarily penetration testing on asphalt samples.

Douglas also operated a marine dock at the northeastern portion of the site along the Willamette River. The marine dock received asphalt by barge via a pipeline connecting the dock to the asphalt facility. The original dock was replaced with the existing dock which is located directly northeast of the marine terminal. Erro operated a lubrication (lube) oil distribution facility at the asphalt plant from 1982 until approximately 1991. Lube oil was stored in ASTs from the former Douglas facility.

2.2.3 Permits

The McCall marine terminal operates consistent with NPDES permit no. 1300-J for stormwater run off to the Willamette River; NPDES permit no. 500-J for boiler blowdown discharge to the Willamette River; and air contaminant discharge permit no. 26-3058 for fuel burning equipment such as boilers.

2.2.4 Waste Handling Practices

Solid-phase waste generated at McCall includes oil-water separator solids, tank bottom solids, and oil-absorbent booms and pads. Liquid-phase waste includes rinsate from tank cleaning activities, slop tank water, slop tank oil and grease, oil from the oil-water separator, and waste solvents from equipment cleaning at the materials testing laboratory.

Oil-water separator solids are routinely pumped and sent off-site to a permitted Resource Conservation and Recovery Act (RCRA) treatment, storage, and disposal (TSD) facility. Tank bottom solids are collected in 55-gallon drums or in roll-off boxes and disposed of off-site at a permitted RCRA TSD facility. No tank bottom solids are disposed on site. Oil-absorbent booms and pads used in spill cleanup operations are placed in 55-gallon metal drums and also disposed of at a permitted RCRA TSD facility. Liquid-phase waste, including rinsate from tank cleaning activities and slop tank water, are directed to the oil-water separator. Effluent from the oil-water separator and stormwater are tested weekly for pH and oil and grease content and discharged to the Willamette River in accordance with the requirements of NPDES permit no. 1300-J. Slop tank oil and oil from the oil-water separator are pumped and sent offsite to a fuels blending facility for reprocessing. Solvent use is restricted to parts cleaning stations at the materials testing laboratory. The parts cleaning stations are maintained by Safety Kleen and waste solvents are periodically transported via Uniform Hazardous Waste Manifest and disposed of offsite by Safety Kleen at a permitted RCRA TSD facility.

2.2.5 Underground Storage Tanks

Records provided by McCall indicate that three underground storage tanks (USTs) formerly existed at the McCall marine terminal site.

A 20,000-gallon ethanol UST and a 4,000-gallon emergency containment UST were removed in 1989 (SAFE, 1994). These tanks were installed in 1979. The tanks were undamaged when removed. No evidence of adverse environmental impact was noted during the removal activities. DEQ records indicate that the 20,000-gallon tank may also have been used to store diesel fuel. A soil sample collected from beneath the 20,000-gallon tank contained 29 parts per million (ppm) total petroleum hydrocarbon (TPH); a soil sample from beneath the 4,000-gallon tank contained 12 ppm TPH. These concentrations were below the DEQ's level 1 soil cleanup concentration of 40 ppm determined by using the DEQ soil cleanup level decision matrix (see OAR 340-122-205 through 340-122-360). Therefore, pursuant to the DEQ regulations, no further action is required.

A 250-gallon heating oil UST next to the marine terminal office building was emptied in 1990. The tank had been used to store heating oil for office space heating, but its use was discontinued when McCall installed a natural gas furnace. The tank remains in place.

2.2.6 History of Releases

Releases of petroleum products have occurred at the asphalt plant and the marine terminal tank farms according to the recollections of site personnel and available DEQ documentation. The majority of the release incidents involved volumes of product ranging from approximately 1 gallon to several thousand gallons of asphalt or bunker fuel (see Table 6). Releases were cleaned up immediately by McCall personnel.

There have been no major spills of diesel at the facility. The few releases that have occurred have been less than 50 gallons. These releases have been responded to immediately; and free product has been recovered and impacted soil removal, if required. The majority of diesel spills are small and are associated with leaking pump packings over concrete secondary containment.

The majority of releases that have occurred at the site involved asphaltic materials or heavy black oil (i.e., bunker fuel). Asphalt is a solid at ambient temperatures and is thus not expected to migrate. Further, asphalt does not meet the definition of "oil" under ORS 465.200(11) and is not a hazardous substance. Black oil is semi-solid (tar-like); at ambient temperatures its potential for migration would be limited. Table 7 summarizes physical properties of the asphalt and heavy oil products handled by McCall.

2.3 Site Investigation and Regulatory Inspection History

2.3.1 Environmental Risk Assessment

In 1985, McCall commissioned an environmental risk assessment of the marine terminal as a requirement for obtaining liability insurance. Risk Science International (RSI) evaluated facility operations and prepared a report, which concluded that the risk of environmental impairment from operations at the terminal was moderate, primarily because of the potential for spills or leaks of materials flowing directly into the Willamette River (RSI, 1985).

2.3.2 DEQ Inspections

In September 1982, the DEQ collected samples of ponded rinsate at the McCall asphalt plant tank farm after tank cleaning activities. DEQ records indicate that McCall was assessed a $500 civil penalty for improper handling of the rinsate. Available records also indicate that the DEQ conducted routine inspections under air contaminant discharge permit no. 26-3058 for boiler operation.

2.3.2 Summary of PA Site Visit

On January 4, 1994, EMCON personnel and McCall representatives visited the McCall marine terminal and asphalt plant. The visit included a tour of the marine terminal tank yard, dock area, wastewater and stormwater collection and discharge systems, and a tour of the asphalt plant tank farm, laboratory, and loading areas. During the tour, minor staining of soil in the marine terminal tank farm was noted. At the asphalt plant incidental small product leaks were noted beneath pipe fittings, pumps, and hose connections in the tank farm and railcar loading area. The leaked material was observed to harden quickly upon cooling and not migrate, facilitating routine recovery operations.

3 WASTE CHARACTERISTICS

3.1 Potential Sources of Hazardous Substances

3.1.1 Products Stored at the Facility

Hazardous materials currently stored in the ASTs at McCall include the following:

Marine Terminal.
- Asphalt
- Diesel fuel
- Marine diesel oil
- Bunker fuel

Petroleum naphthalene and PS-300 were also historically stored in tanks at the marine terminal.

Asphalt Plant.
- Asphalt flux (blending agent)
- Paving-grade asphalt
- Petroleum naphthalene
- PS-300 (80 percent black oil; 20 percent diesel fuel)
- Emulsion-based asphalt
- Latex

These products are stored in ASTs located within the bermed marine terminal tank farm and the asphalt plant tank farm (see Table 5 and Figure 12). The marine terminal is surrounded by an earthen dike coated with emulsified asphalt. The asphalt plant storage tanks are contained within a 4-foot high concrete structure.

Small quantities of vehicle antifreeze, lubrication oils, citric acid based cleaner, greases, and solvents are stored at the materials testing laboratory's bermed storage area at the asphalt plant and inside the equipment maintenance shed at the marine terminal. Solvent usage is limited to the materials testing laboratory. As stated previously, these solvents are used at self contained parts cleaning units supplied and maintained by Safety Kleen.

Hazardous materials formerly used at McCall to clean laboratory equipment and the product loading racks include the following:

- Solvents (e.g., benzene and trichloroethylene)
- Degreasers (e.g., kerosene)
- Chemax 528 (no MSDS available)
- Chevron asphalt remover (no MSDS available)

Solvents, such as benzene and trichloroethylene, and degreasers were used at the asphalt plant to clean laboratory testing equipment and tools. Chemax 528 and Chevron asphalt remover were used to clean the truck loading racks at the marine terminal and asphalt plant. Cleaning was conducted over secondary containment structures and there were no known releases of the products. The use of these materials was gradually phased-out between 1978 and 1985.

3.1.2 Wastes Generated and Managed at the Site

Solid-phase waste generated at McCall includes oil-water separator sludges, tank bottom sludges and solids, and oil-absorbent booms and pads. Liquid-phase wastes include rinsate from tank cleaning activities, slop tank oil and grease, slop tank water, effluent from the oil-water separator, stormwater runoff, and waste solvents used for cleaning equipment at the materials testing laboratory.

Before 1975, waste asphalt and construction debris were reportedly disposed of in the western portion of the site. This practice was discontinued after 1975. Currently, solid waste generated at the facility is transported off-site for disposal consistent with applicable solid waste disposal requirements (see Section 2.2.4). Solvents are transported off-site as hazardous waste for disposal at a permitted RCRA TSD facility. Rinsate is typically not generated during tank cleaning operations; however, if rinsate is generated, it is pumped out of the tank and recycled off-site at a fuels blending facility.

3.1.3 Potential Sources Identified From Site Investigations

Since 1971, a number of investigations have been completed in the Willbridge area; however, no subsurface soil or groundwater investigations have been conducted at the McCall site. While releases have occurred during the McCall facilities operation history, these have primarily consisted of asphalt or heavy oil materials and have been cleaned up immediately following the release. In addition, these materials are solid or semi-solid at ambient temperatures and, therefore, migration is expected to be very limited. Because most of these materials are not liquid at a temperature of 60°F and atmospheric pressure of 14.7 pounds per square inch (psi), they are not hazardous substances under the Oregon Superfund laws (see ORS 465.200 through 465.455) and do not meet the definition of oil under ORS 465.200(11).

3.2 Waste Characteristics Conclusions

Solid and hazardous waste generated by the McCall operations are properly handled. Because of the physical/chemical characteristics (e.g., viscosity) of the materials historically stored at the McCall site (e.g., asphalt and black oil), spills of products in the asphalt plant and the marine terminal tanks farm areas would not be expected to migrate to depth in soil or dissolve readily in water. Also, the spills have been responded to and cleaned up immediately. The possibility of surface runoff contacting McCall's products is minimized because the majority of the products are stored in closed tanks. Further, site engineering controls (e.g., secondary containment berms, and emergency shut-off valves) and the requirements of the facility's NPDES permits limit the possibility that surface runoff potentially impacted by these products will be released to the environment. Consequently, there are not expected to be adverse impacts to human health or the environment associated with releases of asphalt and heavy oil products to soil in the asphalt plant and marine terminal tank farm areas.

4 SUMMARY AND CONCLUSIONS

4.1 Summary

The Oregon DEQ requested that McCall Oil conduct a PA as part of its marine terminal and asphalt operations of DEQ's regional investigation of the Willbridge industrial area. EMCON has prepared this PA on behalf of McCall in accordance with DEQ guidance documents (DEQ, 1992). This PA assessed current and historical chemical and waste handling practices and evaluated potential groundwater, surface water, air, and direct contact targets associated with materials that may have been spilled or released to the environment.

The McCall site and the properties around the site are zoned heavy industrial by the City of Portland (see Appendix A). The site and the properties around the site are currently being used for industrial purposes and have been used for industrial purposes since the early 1900s. Land use is not expected to change in the future. The nearest residential population is located within 0.5-mile southwest of the site. No nursing homes, schools, or hospitals are located within 1-mile.

There have been several historical spills at the McCall site. As noted during the PA site visit, there are currently a number of areas where incidental spills occur during the course of normal operations. These products include asphaltic material and other heavy petroleum products.

4.2 Conclusions

4.2.1 Groundwater

- The crest of the Tualatin Mountains, located west of the site, and the Willamette River, located northeast of the site, are considered hydraulic boundaries.

- Groundwater beneath the site flow varies from northwest to northeast depending on the proximity to the Willamette River. Groundwater discharges to the Willamette River (EMCON, 1994).

- Because of the physical/chemical characteristics (viscosity) of the asphaltic material stored at the McCall site (see Table 7), the material generally does not migrate to depth in soil or dissolve readily in water.

- Historical spills and releases have been responded to and cleaned up rapidly. There is no known adverse environmental impact from these historical releases.

- The depth to groundwater ranges from approximately 15 to more than 20 feet bgs (EMCON, 1994), occurring in a thin (less than 10 feet) section of saturated dredge spoil sediments.

- There is no indication that historical activities at the McCall site have impacted groundwater.

- There is a public water supply that provides potable water to the area.

- There are no domestic groundwater wells or municipal well fields within 1-mile downgradient of the site.

- Groundwater does not appear to be used for industrial purposes within 1-mile downgradient of the site. The nearest well is located at the Chevron facility, upgradient of the McCall site.

4.2.2 Surface Water

- There have been two asphalt spills into the Willamette from barge loading operations and one oil and water spill from the slop tank that apparently reached the river. However, these spills were responded to a timely manner. Furthermore, because of the physical/chemical characteristics (viscosity) of the material (see Table 7), the material is expected to remain localized and not migrate.

- The Willamette River is not used as a source of potable water downgradient of the McCall site.

- Surface water runoff (i.e., stormwater) is controlled and monitored according to the requirements of the NPDES permit.

- Although groundwater discharges to the Willamette River, there is no indication that historical activities at the McCall site have impacted groundwater.

4.2.3 Air

- The soil is covered by asphalt, gravel, and structures (e.g., tanks), all of which reduce potential dust emissions.

- Because the wind speed in the area has been measured at an average of approximately 4.4 mph, substances released to the air would be expected to be rapidly dispersed.

- There is no indication that historical spills or releases at the site have impacted or are impacting air quality.

- Historically, there have been spills or releases to soil. However, these spills have been responded to and cleaned up.

- Current spills are incidental and localized.

- Because of the physical/chemical characteristics of the material stored at the McCall site (e.g., asphalt and Bunker C oil) (see Table 7), and because the majority of products are stored in closed tanks, the potential for volatilization is minimal.

4.2.4 Direct Contact

- The site is predominantly covered by asphalt, gravel, and structures (e.g., building, tanks).

- A site fence (and the Willamette River) discourages and limits access to the site.

- There is surveillance by security personnel after normal business hours which restricts access.

- Historically, there have been spills onto the soil (e.g., black oil, asphalt, caustic soda, and lubricating oil). However, because of the physical/chemical characteristics (e.g., viscosity) of the material stored at the McCall site (see Table 7), the material would not be expected to migrate to any substantial degree. Also, these spills have been responded to and cleaned up in a timely manner.

4.3 Recommendations

Based on the information reviewed by EMCON, interviews with current and past employees, a reconnaissance of the facility, and a review of exposure pathways at the McCall facility, there appears to be no threat to human health or the environment associated with the McCall site nor is there any indication that McCall's activities are impacting off-site properties or the environment. Therefore, EMCON recommends no further assessment or characterization of the McCall facility.

PART III

GREAT WESTERN CHEMICAL COMPANY

1 INTRODUCTION

Part III of this PA report discusses the history, operations, and waste management practices of the Great Western Chemical Company (GWCC), identifies potential hazards, identifies and evaluates pathways of concern, and makes recommendations for further study.

The scope of this PA was limited to include a review of available file information, interviews with former and current employees, and a reconnaissance tour of the facility. EMCON requested that GWCC review their files and provide EMCON relevant documents and information. EMCON subsequently reviewed the documents provided. Employees are not cited individually. Table 8 lists the titles and dates of employment, for those employees who participated in the interviews.

2 BACKGROUND

2.1 Site Description

GWCC facilities on the subject site include two distinct operating entities, the Technical Center (formerly known as Chemax) and the Portland Branch. The Technical Center produces water treatment chemicals, industrial cleaning agents and sanitizers, and other products under the Chemax or Great Western brand names. The Portland Branch receives, stores, and repackages chemicals, as well as, distributes gaseous, liquid, and dry chemicals. The Technical Center has been operating on this site since early 1984; the Portland Branch has operated on the site since 1985.

The Technical Center occupies approximately 18,000 square feet on the northwestern end of the main GWCC warehouse (see Figure 13). Products are mixed in designated liquid and dry mixing areas, on two levels inside the warehouse. Bulk chemicals used in production are stored in approximately a dozen outside ASTs behind the warehouse, and in steel or polypropylene drums and totes both inside and outside the warehouse. Chemicals packed in cardboard drums, paper bags, and plastic bags are stored on pallets inside the warehouse. Outside storage tanks are set on elevated concrete pads and are surrounded by 4-feet-high concrete containment berms. Drums are stored on pallets over concrete floors (inside) or asphalt paving (outside). Totes are stacked on asphalt surfaces. There is a small maintenance shop on the north side of the warehouse. Polymers received by rail are pumped through overhead piping and hoses from the railcar loading area in the front of the facility to the storage tanks behind the warehouse. The Technical Center offices and a small testing laboratory are located in the front northwestern corner of the building.

The southeastern half of the warehouse, comprising an area of approximately 35,000 square feet, is occupied by the GWCC Portland Branch (see Figure 13). The area inside the warehouse is reserved for storage of food-grade chemicals and oxidizers. Two adjacent tank farms for bulk storage of solvents and acids are situated southeast of the warehouse. The tank farms are surrounded by continuous 2-feet-high concrete containment berms. ASTs within the bermed areas are set on raised concrete pads. The floor of the tank farms is concrete. A chemical loading rack for solvents and acids is behind the warehouse.

A covered drumming shed is located next to the acid tank farm. A covered shed for the storage of drums containing chlorinated solvents is immediately northwest of the drumming shed. Both the drumming shed and storage shed have lined liquid collection trenches and sumps to contain potential spillage and washdown water. A paved outdoor drum storage area is used for other non-chlorinated solvents, alcohols, and acids. Gases are stored by hazard class in covered, designated areas outside in back of the warehouse. A railcar unloading area is located next to the solvent tank farm on the southwest side of the warehouse along NW Front Avenue. Plant offices are located in front of the facility, on the southwest corner of the warehouse. Another recently constructed, high-density warehouse consisting of approximately 22,000 square feet is located on the northwest corner of the GWCC site. The warehouse, which was constructed in early 1994, is used by the Portland Branch to store technical-grade chemicals for use by the electronics semiconductor industry.

The site is bounded on the southwest by NW Front Avenue, on the southeast by the McCall asphalt plant, on the northeast by a vacant strip of Port property and the McCall marine terminal, and on the northwest by land leased to Union Oil of California (Unocal) for a pipeline and distribution dock.

Chevron, Unocal, and Shell operate bulk petroleum distribution facilities across NW Front Avenue near of the GWCC site. The Tube Forgings of America facility borders the McCall marine terminal and asphalt plant on the southeast.

2.2 Ownership and Operational History

2.2.1 Ownership History

GWC Properties, Inc., a McCall subsidiary, purchased the GWCC site in late 1982 from Flintkote. Flintkote operated an asphalt roofing materials manufacturing plant on the property for 35 years. Flintkote purchased the property from the Port of Portland in 1946 (see Table 9).

2.2.2 Operational History

Aerial photographs from the 1930s and early 1940s show that the site was vacant of buildings, but may have been used as a log staging area (see Appendix B). A boat dock appears in photographs from 1936 and 1948, off the north corner of the property, and a dirt road appears to have led to a cluster of small shacks and to the dock. Appendix C presents a series of enlarged aerial photographs of the site from 1948 to 1992, and Appendix G presents photographs of GWCC facilities taken during EMCON's PA site tour. These photographs supplement the following descriptions of historical site operations (see Table 9).

Flintkote Operations. In 1947, Flintkote constructed a plant to manufacture asphalt roofing material. The asphalt shingle manufacturing process apparently involved saturating felt material with asphalt, then coating the felt with asphalt and colored sand granules. Rock dust was used as a filler, presumably in the coating process. There is a record of talc and lime dust storage at the facility. Flintkote may also have manufactured reflective aluminum paint.

A pre-1966 facility map indicates that there were several subgrade conveyors both within the Flintkote plant, beneath the roofing machine in the back, or northeastern side, of the building, and outside, beneath several granule silos in front of the plant (see Figure 14). Overhead conveyors carried granules from the silos and rock dust from the filler house in back of the plant to hoppers above the roofing machine. Several warehouse areas stored finished products. A boiler house and pump house were situated southeast of the plant. Four 18,000-gallon aboveground tanks contained fuel oil for the boiler, saturator asphalt, coating asphalt, and flux for blending the asphalt. The tanks were surrounded by 6-foot-high concrete dikes. Retorts associated with the saturator and coating tanks, and various stills were also present behind the plant and to the southeast, as were a subgrade steel-lined skimmer tank, and a concrete-lined salvage oil pit.

Flintkote operated under various permits from the Columbia-Willamette Air Pollution Authority (CWAPA). In the early 1970s a filter bag system was installed to collect dust from a rotary kiln inside the filler dryer house; during this period, an electrostatic precipitator and rotoclone also were installed to control saturator emissions. Apparently, these were ongoing problems with precipitator breakdowns and ruptured filter bags after these controls had been implemented. These breakdowns, along with numerous citizen complaints about airborne asphalt particles and opacity violations, were the focus of substantial correspondence between CWAPA and Flintkote. There is also record of two fires at the plant, one in 1967 in the felt coating tank, and one in 1977, when the electrostatic precipitator cells burned.

The Flintkote operation consumed approximately 9,800 tons of asphalt saturant and 4,800 tons of asphalt coating per year, as well as 10,000 barrels of fuel oil. Excess saturant was burned in the boilers. Other solid wastes, including granule scrap and baghouse dust, were reportedly transported off-site to the Portland landfill. Fuel for the boilers was supplied by Shell.

The Flintkote property was not paved, and asphalt transfer piping from the Douglas plant to Flintkote appears to have leaked product onto the ground behind the roofing plant (see Figure C-3, 1971 photograph, Appendix C). Before air controls were implemented, the area behind the plant was covered with what appears to be white dust, presumably from the rock filler silos and rotary kiln. Other areas of the property appear to be disturbed or covered with a liquid material (see Figure C-3, 1971 photograph, Appendix C). Flintkote reportedly disposed of unusable product and asphalt in pits behind the plant. Roofing materials -- shingles and colored granules -- and areas where asphalt was disposed of were observed behind the former Flintkote plant during GWCC construction activities. In addition, Flintkote reportedly used solvents during routine cleaning operations to remove coated asphalt from tools and machinery.

In late 1982, GWC Properties, Inc., purchased the property. In early 1983 GWCC began converting the former Flintkote facility for use by the Chemax and Portland Branch operations. Chemax began operations at the site in early 1984, and the Portland Branch moved to the site in late 1985.

GWCC Portland Branch. The Portland Branch primarily receives and stores bulk quantities of industrial (technical grade) chemicals (see Appendix H), transfers these chemicals into 5-, 30-, and 55-gallon steel and polyethylene drums, and distributes the materials to chemical users throughout the Northwest. The facility also receives, stores, and distributes chemicals in 55-gallon drums that do not require transferring.

Bulk acids and solvents are received by rail. Two railcar unloading areas are located immediately southwest of the solvent tank farm (see Figure 13). Transfers from railcars are usually performed via hoses connected directly to the appropriate storage tank, although tote containers may also be used for solvent transfer. Drip pans are placed beneath pumps and hose connections during transfers. After the offloading of chemicals has been completed, hose ends are placed into a concrete tank to contain drippings.

Bulk chemicals may also be brought in by truck and unloaded in the covered drumming area next to the tank farm. Trucks may also unload outside the covered area next to the tank farms; the area is paved with asphalt.

Bulk chemicals are stored in 28 ASTs ranging from 10,000 to 30,000 gallons in capacity and in seven 4,000-gallon tanks. Each bulk AST is located outdoors and is surrounded by concrete berms within the solvent and acid tank farms. A steel drip pan is installed under the pumps and hose couplings in the solvent tank farm to contain potential leaks. Chemicals typically stored in bulk quantity at the site include the following: sulfuric, phosphoric, and hydrochloric acids; acetone, xylene, and toluene; perchloroethylene (PCE), trichloroethylene (TCE), methylene chloride, methylethylketone (MEK), and methyl isobutyl ketone (MIBK); ethanol, methanol, and isopropyl alcohol (IPA); as well as proprietary mixtures containing styrene, alcohol blends, and aliphatic hydrocarbons (see Table 10).

Bulk chemicals are transferred into tanker trucks at the covered chemical loading rack. One side of the rack is reserved for transferring acids; the other side of the loading rack is reserved for transferring solvents. Overhead pipes connect the acid and solvent tank farms to the loading rack. The chemical loading rack area is also sometimes used for rinsing chemical residues from drums. Rinsate and spillage from acid loading activities are collected in sumps and pumped to a wastewater neutralization system. Any solvent spillage is contained and transported via Uniform Hazardous Waste Manifest to a permitted RCRA TSD facility.

A loading rack located southeast of the tank farm was used in the past by GWCC to load caustics onto tanker trucks. This area was not always paved. The rack is now used by the McCall asphalt facility.

Bulk chemicals are transferred into steel or polypropylene drums in a paved, covered drumming area. Inadvertent acid spillage is collected in a sump and pumped to the wastewater neutralization tank. Solvent spillage in the drumming area is contained, accumulated, manifested, and transported to a permitted RCRA TSD facility for disposal.

The unpaved strip of land between the GWCC facilities and the McCall marine terminal (see Figure 9) was previously used for exterior truck washing. This practice was discontinued several years ago. Truck washing now takes place in the covered loading area.

The Portland Branch facility has secondary containment for its tank farms and transfer operations, except in the railcar unloading area. Most of the outside, uncontained areas have been paved with asphalt since operations began in 1984 (see Figure 13); those areas that were not paved from the beginning were subsequently paved in the intervening years. Incidental acid drippage from the loading rack and drumming areas and wastewater collected inside the plant are pumped to the wastewater neutralization tank; wastewater collected inside the plant also is pumped to the neutralization tank. Water is tested for pH, adjusted if necessary, and then discharged to the city of Portland sanitary sewer in accordance with permit requirements. Rainwater collected in the solvent tank farm is directed to a separate collection tank. The water is tested for pH, chlorinated hydrocarbons, and total toxic organics (TTO) prior to each batch discharge to the City sanitary sewer. If organics in excess of 1.37 parts per million (ppm) are detected in the wastewater, the wastewater is passed through carbon filters for treatment and retested before discharge (see Appendix I).

Spills that may occur in the warehouse are immediately diked, and absorbent material is applied. The material is then swept up and placed into drums for appropriate disposal. Small amounts of spilled powdered material are washed down into the wastewater collection trenches and sumps.

A daily walk-through inspection is conducted at the end of the work shift as part of a shut-down procedure to check valves, pumps, hoses, solvent and acid storage and loading areas, and drum storage areas. A comprehensive monthly inspection is also conducted. All inspection records are maintained onsite. Copies of inspection forms are included as Appendix J.

GWCC Technical Center. The Technical Center, known as Chemax until 1989, began operations at the site in early 1984. The facility has produced a number of different products, including water treatment chemicals, such as scale and corrosion inhibitors; dry and liquid industrial cleaning agents and sanitizers; oxygen scavengers; steam line treatment chemicals such as cyclohexylamine; wood treatment products; and concrete additives. Current operations involve liquid and dry mixing, drumming of chemicals, washing totes and drums, and handling and managing wastes and wastewater. Chemicals currently stored onsite are listed in Appendix H.

When operations commenced at the site in 1984, one of the first production processes involved copper sulfate ($CuSO_4$), an algicide. The $CuSO_4$ production area consisted of three mixing tanks and four cooling, or crystallization, tanks. The production area was located outside the warehouse. The tank area also located outside the warehouse, was concrete bermed (see Figure 13). Production of $CuSO_4$ was discontinued in approximately 1988.

Chemax also produced chromated copper arsenate (CCA), a wood preservative, in a production area located inside the warehouse from 1984 until 1988. The production area included a storage tank for arsenic acid, one for washdown water, and a third for mixing. Production occurred inside a concrete bermed area; spills drained into a trough and were pumped out for reuse in the process.

Concrete additives for air entrainment, curing, and water reduction were produced from 1983 to 1985. The production area was inside the building; and production occurred in two 5,000-gallon tanks. Raw materials used to manufacture these products included corn syrup, lignins, xylenes, and zinc oxide.

All products currently produced at the Technical Center are blended products, most of which are mixed in batches in kettles located in the liquid and dry mixing areas (see Figure 13). Some of the kettles are heated. Liquid products are primarily made in batches of 500 to 2,000 gallons. Chemicals mixed outside the building include ammonium thiocyanate, and a silicone defoamer containing approximately 60 percent diesel fuel. The products are mixed in dedicated tanks.

The Technical Center also receives and repacks polymers for sale. Some of the raw materials for Chemax products are received and stored in 55-gallon drums, totes, and bags in the warehouse area. Some bulk chemicals, primarily Calgon polymers, are received by rail. Large storage tanks located outside the building are used to store polymers, caustic soda, sodium hypochlorite, and polyacrylic acid; the tanks range in size from 5,000 to 20,000 gallons. A 1,000-gallon poly storage tank is used for containing and neutralizing wastewater from inside the plant. All tanks, with the exception of the water tank, are situated in bermed areas. Finished products are stored, primarily in 55-gallon drums, inside the warehouse.

From 1984 to 1989, a cooling tower cleaning product was manufactured at the facility which contained hexavalent chromium (Cr^{+6}). The product was used as a tracer and a rust preventative. The product was mixed in a tank or drum, inside the building over a concrete floor with secondary containment inside the production warehouse area. Other chemicals previously used on site included: formaldehyde, sulfuric acid, and sodium chlorite (in 25 percent solution). Solvents previously used included IPA and methanol blends, and xylenes. Solvents currently being used include the following: a blend containing Chevron 350B, orthodichlorobenzene (used as a fuel additive), kerosene (used in silicone defoamer), and methylene chloride and 1,1,1-trichloroethane (TCA), which are blended for use as a paint stripper. Solvents are pumped out of drums into mixing tanks in the liquid mixing area. Partial drums are saved to be used in subsequent batches. Small amounts of solvents are also used in the testing laboratory for cleaning glassware.

Drums that contained primarily caustics and phosphoric acid are rinsed in a designated, contained area located inside the plant. The drumming area floor is concrete with a fiberglass coating on the surface.. Some drums (primarily metal) are sent to Myers Drum or Northwest Cooperage for recycling; others (primarily polypropylene) are stored outside and saved for reuse.

Floors inside the plant are high pressure washed daily to several times per day. Water runs into floor gutters and sumps, and is then pumped into the neutralization tank. From there it is discharged, in compliance with GWCCs industrial wastewater pretreatment permit requirements, to the City of Portland sanitary sewer. Wastewater is tested for pH and analyzed for ammonia and sulfate. The City previously required testing for liquid amines because of their flammability and corrosivity. However, since the wastewater is pH adjusted and amines were of consistently low concentration, this requirement was suspended. Analytical reports from the laboratory are maintained onsite. Floors and containment areas appear to be in good repair.

2.2.3 Permits

The GWCC Technical Center operates under several permits, including a City of Portland industrial wastewater discharge permit (No. 400-060), an NPDES permit from the DEQ for stormwater discharge, and 1200-H tank permits from the fire department. The Portland Branch retains a separate wastewater discharge permit from the City of Portland (No. 400-003). Copies of the wastewater and stormwater permits, as well as test results for wastewater generated at the Technical Center, are provided in Appendix I.

2.2.4 Waste Handling Practices

Solid-Phase Wastes. Solid-phase wastes generated at the Portland Branch are limited to container residues, minor amounts of sludge from sumps, absorbent material used to clean up small spills, and chemical material from torn bags. Materials from torn bags or inadvertent spilling are used at the Technical Center whenever practical. The Portland Branch is registered as a large quantity hazardous waste generator (DEQ, 1991a). The Technical Center is registered as a conditionally exempt generator (DEQ, 1991a). Wastes generated at the Technical Center include: solids from wastewater collection sumps, absorbent material used to sweep up small spills, off-specification products, and small amounts of flammables, acids, and solvents. When CCA and $CuSO_4$ were produced at the facility, these processes generated some residual material that could not be reused. That material was removed, containerized, and transported by Uniform Hazardous Waste Manifest as an off-specification product, to the permitted RCRA TSD facility in Arlington, Oregon (Arlington).

The Technical Center at one time received spent copper sulfate and chromic acid, which are by-products of the fabrication of printed circuit boards. The Technical Center attempted to recover some of these materials for use in the $CuSO_4$ and CCA processes. The virgin chemical materials originated in California and were shipped to the Portland Branch for distribution to electronics manufacturers. The spent materials from the electronics manufacturers were then returned to the Portland branch and were either distributed to the Technical Center or were transported back to the original California manufacturer. The DEQ files contain substantial correspondence between GWCC, the state of Oregon, and the state of California as to how these materials should be classified. The Technical Center discontinued its attempt to recycle the material. The material was disposed at a RCRA TSD facility in Arlington, Oregon.

Liquid-Phase Wastes. Wastewater from the Technical Center and Portland Branch facilities is collected separately; it is directed to separate outside wastewater neutralization tanks at each facility. Rainwater from the solvent tank farm is collected in a separate tank and tested for pH, chlorinated hydrocarbons, and TTOs. The water is treated with activated carbon, if necessary, before permitted batch discharge to the City of Portland sanitary sewer. At the Technical Center, washdown water in the mixing areas is collected in sumps and stored in drums to be used in subsequent batches of the same product.

2.2.5 History of Releases

Flintkote operations resulted in releases of asphalt, both from apparent leaking pipelines and from apparent disposal of asphaltic materials behind the facility.

Spills of chemicals have occurred at the site from GWCC operations (see Table 11). The majority of these spills have been contained within bermed areas and have been cleaned up without a release to the environment. A release of Cu_4 from an evaporation structure was discovered when the structure was abandoned in 1989; the containment structure (concrete liner) was apparently cracked. A release was also discovered in 1993 beneath the former CCA process area, during excavation activities for a new sump (see Figure 15).

2.3 Site Investigation and Regulatory Inspection History

Since 1985 several environmental related studies have been conducted at the Technical Center at the request of GWCC. In 1984, a site risk assessment was conducted as a requirement for obtaining a pollution liability insurance policy (RSI, 1984). In 1990, two test borings were drilled, and one monitoring well was installed near the former $CuSO_4$ evaporation structure as part of GWCC's investigation of a possible release from that area (EMCON, 1990). In 1993, four additional monitoring wells were installed in response to a suspected historical release in the former CCA production area. These studies and the site visit conducted for this suspected historical PA are summarized below. Analytical results are contained in the referenced reports, available at McCall corporate headquarters.

2.3.1 Environmental Risk Assessment

Shortly after beginning operations at the site, GWCC commissioned an environmental risk assessment of the Technical Center as a requirement for obtaining a quotation for environmental impairment liability insurance. Risk Science International (RSI) evaluated plant operations and prepared a report. The report concluded that the risk of gradual environmental impairment from operations at the plant was low-to-moderate. The RSI report also concluded that the risk had to do with the hazardous nature of the materials handled at the plant and a slight potential for spills and impact of stormwater runoff (RSI, 1984).

2.3.2 Copper Sulfate Containment Structure Excavation

Part of the $CuSO_4$ formulation process included the use of a containment structure for process water. The containment structure was located below grade and lined with concrete and fiberglass. The structure was approximately 20 feet long by 15 feet wide and 3 feet deep. Following cessation of the $CuSO_4$ formulation operation in late 1987 or early 1988, the structure was used for a short time to hold process water from the CCA formulation operation. Use of the containment structure was discontinued in 1989.

Assessment and remedial activities were undertaken by GWCC when it was discovered that the containment structure had developed a crack in the concrete that lined the bottom of the structure. These activities are summarized in an October 22, 1990, letter from Lee Zimmerli of GWCC to Mr. John Odisio of the DEQ (GWCC, 1990).

EMCON was retained by GWCC to evaluate groundwater impacts before excavating the structure. The removal of the structure and overexcavation of surrounding soils was undertaken by Chemical Waste Management, Inc. (Chem Waste).

EMCON advanced two test borings adjacent to the containment structure (see Appendix K). No visible soil staining was observed. Arsenic was detected in one groundwater sample at 0.009 mg/L, below the MCL of 0.05 mg/L. Soil samples from each boring were analyzed for TCLP metals. Barium was detected in soil at concentrations up to 0.22 mg/kg (EMCON, 1990).

Following removal of the structure and surrounding soil, EMCON prepared a composite sample from the sidewalls of the excavation. The results of laboratory analysis indicated that concentrations of copper, chromium, and arsenic remaining in the excavation did not represent a threat to human health or the environment (EMCON, 1990).

2.3.3 CCA Cleanup and Characterization

Background. From 1984 until 1988 Chemax formulated and distributed a product containing 50 percent CCA under the subregistration name of "Woodlast." The CCA product was stored and mixed in three 5,000-gallon tanks located inside the Chemax facility (see Figure 15). In 1992, during the construction of two concrete sumps in the former CCA formulating area, GWCC maintenance and production workers discovered discolored concrete, gravel, and subsurface soils in the area below the concrete floor on the northeast side of the warehouse. Upon discovery, GWCC contracted with EMCON to assist in investigating environmental impacts. A report summarizing the investigation and cleanup activities including the current status of the study is included as Appendix L (EMCON, 1994).

In response to the discovery of the release, soil and debris were removed and disposed of at a permitted RCRA TSD facility. Soil and debris were classified as characteristic hazardous waste (waste codes D004 and D007). The area excavated was approximately 20-foot wide by 40-foot long and ranged to 14-foot deep. The average depth of the excavation was approximately 8 to 10 feet.

Discrete samples were collected and analyzed for CCA during the removal process to confirm that the cleanup objectives were met. The arithmetic mean of the discrete soil sample concentrations for CCA was below the cleanup criteria. Following confirmation sampling, the excavation was backfilled and the concrete floor repaired.

A groundwater assessment was also conducted in the area of the CCA release. Monitoring well locations are shown on Figure 13, and well logs are included in

Appendix K. Concentrations of copper, chromium, and arsenic have been detected in groundwater above applicable regulatory criteria. However, no monitoring well has consistently exceeded USEPA-established maximum contaminant levels (MCL) for chromium or arsenic. As stated previously, groundwater is not used for drinking water in the area of the site. The groundwater assessment also suggests that concentrations in groundwater may be declining, and that CCA constituents above regulatory standards are not migrating off-site. Based on available information and a preliminary impact evaluation, there is no apparent threat to human health or the environment from substances in soil or groundwater.

2.3.4 Summary of Site Visit

On January 4, 1994, EMCON personnel and GWCC representatives conducted a reconnaissance site review of the GWCC Portland Branch and Technical Center. They toured each GWCC facility, including the Technical Center process and storage areas, outside tank storage areas, stormwater and wastewater discharge systems, and maintenance shop, and the Portland Branch tank farms, storage areas, transfer facilities, and wastewater system. Secondary containment systems appeared to be sound, and there was no evidence of spills in the process or product storage area.

3 WASTE CHARACTERISTICS

3.1 Potential Sources of Hazardous Substances

3.1.1 Products Stored at the Facility

Little is known about the products stored at the Flintkote facility from 1947 to 1982. Most certainly these products included asphalt, fuel oil, and flux material, stored in 18,000-gallon ASTs surrounded by 6-feet-high concrete berms (see Figure 14). It is also possible that kerosene or solvents would have been stored for use onsite to remove asphalt from equipment and machinery. A 1,000-gallon UST, apparently used for gasoline and formerly located in the southeast loading dock area, was installed by Flintkote in 1953 (SAFE, 1994). This tank was removed in 1989 (Hahn and Associates, 1989). Two soil samples collected in the excavation contained 37 ppm and 69 ppm TPH, which was below the DEQ's soil cleanup level of 80 ppm determined by using the DEQ soil cleanup level decision matrix (Hahn and Associates, 1989).

An unregulated heating oil tank, located in the southwest loading dock area, was formerly used to store fuel for the plant boiler. The 6,000-gallon tank was apparently located partially below grade. It had not been used since late 1979. In March 1994, the tank was cleaned and decommissioned by filling it with concrete.

Products stored in bulk quantity at the Portland Branch include a variety of acids and solvents, which are stored in ASTs ranging in capacity from 1,500 to 30,000 gallons (see Table 10 and Figure 13). Solvents and acids are segregated into separate tank farms surrounded by concrete secondary containment structures.

In addition to the bulk materials stored in ASTs, a wide range of products packaged in 55-gallon steel and poly drums, tote containers, and bags are also stored on-site. These products include the following: acids, solvents, caustics, oxidizers, food-grade chemicals, corrosives, alcohols, flammables, and gases. Packaged products are segregated by class. Oxidizers and food-grade chemicals are stored in the main warehouse; flammables, corrosives, and other hazardous chemicals are stored in designated areas on asphalt pavement outside the warehouse (see Figure 13). Chlorinated solvents are stored in a covered shed with secondary containment. Cylinders containing various gas products are stored in a covered concrete area next to the back of the warehouse. A complete listing of products stored on-site is included in Appendix H.

Technical-grade products for use by the semiconductor industry have recently been moved to the new warehouse located on the northwest corner of the site.

Products stored in bulk quantity at the Technical Center include the following: various polymers, caustic soda (50 percent solution), polyacrylic acid, and sodium hypochlorite (12.5 percent solution). These products are stored in outside ASTs surrounded by concrete containment structures. Other raw materials and finished products are packaged in 55-gallon drums, totes, and bags. The majority of these products are stored inside the warehouse. A complete listing of products stored at the facility is included in Appendix H.

From 1984 to 1988, the Technical Center stored raw materials used for copper sulfate production, including sulfuric acid and spent $CuSO_4$. Sulfuric acid was stored outside in a 6,000-gallon AST in the $CuSO_4$ process area. Spent $CuSO_4$ received from the electronics industry was stored in drums outside along the northeast side of the warehouse. Arsenic acid and chromic acid, raw materials used in blending CCA, were stored at the site from 1984 to 1989. From 1984 to 1989, hexavalent chromium (Cr^{+6}) was used in the production of cooling tower chemicals. The Cr^{+6} solution was mixed and stored in the Stock 5 tank. Corn syrup, formaldehyde, and sodium chlorite were also previously stored onsite, in outside ASTs provided with secondary containment.

Solvents currently used on-site include Degreaser #1 (528), which contains solvent 350B (a Chevron blend); orthodichlorobenzene, used as a fuel additive; and methylene chloride and 1,1,1-TCA, blended for use as a paint stripper. Solvents previously used at the Technical Center include IPA and methanol blends (used for airline antifreeze); ADI (anti-detonant injection mixture), which may have been a methanol blend; and xylenes, mixed with zinc oxide in Azcon (a concrete additive formerly produced on-site). Each of these products was formulated in the liquid mixing area.

The various products stored at the site represent potential sources of hazardous substances releases primarily under circumstances of containment failure. Tank failures could result in a release to secondary containment structures. Pipeline failures could result in a release of product to the ground if failure occurred in an unpaved area. In such an instance, or in the unlikely case of secondary containment failure, a release could impact the soil, surface water, air, and groundwater pathways. Failure of packaged products containers in the warehouse, or drums and totes in the yard, could also result in releases of hazardous substances. Cleanup procedures at GWCC include the use of personal protective equipment and health and safety procedures to reduce direct contact with hazardous substances.

3.1.3 Wastes Generated and Managed on the Site

Solid-phase wastes generated at the GWCC site are primarily absorbent material used to clean up spills, scrapings from polymer tanks and transfer operations, and packaging from raw materials. Because the Technical Center now manufactures blended products, waste from its operations is greatly reduced. Liquid-phase wastes include floor washdown water from inside the warehouse and Technical Center, and surface drainage from the outside paved areas. Past and present waste handling practices are discussed in Section 2.2. Solid-phase wastes generated at the GWCC facilities have never been disposed of on site. Final disposition of solid-phase waste is accomplished by off-site transport to a local landfill (if determined nonhazardous), to the Chem-Security, Inc., landfill in Arlington, Oregon (if determined hazardous), or, in the case of the polymer scrapings, to a Laidlaw, Inc., facility in the eastern United States for incineration. Wastewater, as discussed in Section 2.2, is discharged under permit to the City of Portland sanitary sewer, and stormwater is discharged under an NPDES permit to the Willamette River.

On-site disposal of asphalt by the former Flintkote facility could impact the soil; however, the solid nature of asphalt (i.e., physical/chemical properties) minimizes its migration. It is also unlikely that buried asphalt would affect the groundwater pathway. Subsequent asphalt paving of the site also reduces the likelihood that buried asphalt would impact the air, surface water, or groundwater pathways.

3.1.4 Potential Sources Identified From Site Assessments

Two potential sources have been identified by previous site assessments and by the PA site visit. Low concentrations of copper, chromium, and arsenic are present in groundwater as a result of a release to soil in the former CCA process area (EMCON, 1994). Sidewall samples taken from the excavation of the former copper sulfate evaporation structure indicate that low concentrations of copper, chromium, and arsenic remain in soil (EMCON, 1990).

3.2 Waste Characteristics Conclusions

Solid and hazardous wastes generated by GWCC are properly handled. The concentrations of inorganic compounds within soil at the site do not appear to pose a threat to human health or the environment. Direct contact with on-site soils or other sources of hazardous substances by GWCC workers is further reduced by the health and safety controls in place at GWCC facilities. Furthermore, there is adequate site security and the majority of the site is paved, covered with gravel, or covered by buildings.

Because there is no downgradient use of groundwater within 1 mile of the site and within the hydraulic boundaries, the potential threat to human health posed by chemical substances in groundwater beneath the site is low. Groundwater beneath the site apparently discharges to the Willamette River. However, substances in the groundwater would be substantially diluted upon entering the river.

Potential impacts to human health or the environment that could result from surface water runoff are reduced by the requirements of GWCC's NPDES permits.

Table 9

Great Western Chemical Corporation [a, b]
Ownership and Occupational History—GWCC Site

Year	Activity
1946	Flintkote buys land from Port of Portland (Tax lot #17).
1947	Flintkote begins asphalt shingle manufacturing operations (5700 NW Front Ave.).
1982	GWC Properties, Inc. buys land from Flintkote.
1983	Chemax facility constructed at old Flintkote factory.
1984	Chemax facility begins operations; Portland Branch begins operations in adjacent facility later in the year.
1993	Great Western Chemical (Portland Branch) is listed as the occupant for 5540 NW Front (this is the first listing for this address). Chemax still listed for 5700 NW Front.

[a] Compiled from Multnomah County ownership records and city of Portland occupancy records.
[b] See Figures 2 and 5.

Table 10

Great Western Chemical Corporation
Tank Contents and Capacities—GWCC Portland Branch

Tank Number	Capacity (gallons)	Contents
1	20,000	Ethylene glycol
2	20,000	Solvent 350B
3	20,000	Isopropyl alcohol
4	20,000	Acetone
5	20,000	Empty
6	20,000	Water
7	20,000	Special Naphtha Light (aliphatic)
8	20,000	Water
9	10,000	Isopropyl alcohol
10	10,000	Calcium chloride
11	10,000	Solvent 350 B
12	10,000	Toluene
13	10,000	Propylene glycol
14	10,000	Perchloroethylene
15	10,000	Empty
16	10,000	Xylene (aromatic)
17	10,000	Methanol
18	10,000	Parasolv 1-190
19	30,000	Triethylamine 119
20	4,000	Methyl ethyl ketone
21	4,000	Methyl ethyl ketone
22	4,000	1,1,1-Trichloroethane
23	4,000	Empty
24	4,000	Empty
25	4,000	Empty
26	4,000	Blending tank for IPA (80/90%)
A1	6,000	Muriatic acid (HCl)

Table 10

Great Western Chemical Corporation
Tank Contents and Capacities—GWCC Portland Branch

Tank Number	Capacity (gallons)	Contents
A2	6,000	Phosphoric acid (75%, technical)
A3	15,000	Nitric acid (degree 42, HNO3)
A4	15,000	Sulfuric acid (H2SO4)
A5	15,000	Sulfuric acid (H2SO4)
A6	20,000	Sulfuric acid (H2SO4)
A7	20,000	Sulfuric acid (H2SO4)
A8	20,000	Sulfuric acid (H2SO4)
A9	20,000	Cutting and mixing tank
NT	11,000	Water
V1	2,000	Trichloroethylene
V2	2,000	Trichloroethylene

Table 11

Great Western Chemical Corporation
Summary of Historical Spill Releases—GWCC[a]

Number	Dates	Material Released	Location (see Figure 15)	Description
1	1988 or 1989?	H_2SO_4	On blacktop (drumming area)	A drum of H_2SO_4 split open. Spill was diked and cleaned up with sorbent material.
2	?	CO630 (surfactant)	Railcar loading area	Release during tank car offloading --cleaned up,
3	?	H_2SO_4	Acid tank farm	Valve apparently left open; quantity unknown, but spill contained within bermed area.
4	1987 or 1988?	H_2SO_4	Acid tank farm	Bottom of tank corroded, approximately 20,000 gallons spilled into bermed area. Acid was pumped into trucks and tanks were repaired and raised onto pads.
5	?	Rinsate	Drum rinse area	Rinsate from drum rinsing operations occasionally ran onto dredge spoils. Mostly acid drums, possibly some solvent drums.
6	?	Calgon Cat-Floc	Technical Center railcar loading area	Several incidental spills, cleaned up and put into totes.
7	1990	1,1,9-Triethylamine	Portland Branch Railcar loading area	Railcar leaked over the weekend in the loading area. Soil was tested by Hahn & Associates. No further action required. No detections. Amount of spill was below the reportable quantity limit.
8	1984 (?) - 1988	$CuSO_4$	$CUSO_4$ containment structure	Crack in the concrete $CuSO_4$ containment structure was discovered during decommissioning activities. Soil was overexcavated beneath the structure and soil and concrete were disposed of off-site at TSDF.
9	1984 (?) - 1989	CCA	CCA Process Area	A prior release was discovered in 1992 during excavation in the former CCA Process Area. Soil and concrete were excavated and confirmation samples were collected from the excavation. Concrete and soil were disposed of off-site at TSDF. Groundwater monitoring continues.

[a] Spill information is based on recollections of site personnel during employee interviews conducted February 15 and 16, 1994.

4 SUMMARY AND CONCLUSIONS

4.1 Summary

The Oregon DEQ requested that GWCC, Portland, Oregon, conduct a PA of its Front Street facility as part of DEQ's regional investigation of the Willbridge industrial area. EMCON has prepared this PA on behalf of GWCC in accordance with DEQ guidance documents (DEQ, 1992). This PA assessed current and historical chemical and waste handling practices and evaluated potential groundwater, surface water, air, and direct contact targets associated with materials that may have been spilled or released to the environment.

The GWCC site and the properties around the site are zoned heavy industrial by the City of Portland (see Appendix A). The site and the properties around the site are currently being used for industrial purposes and have been used for industrial purposes since at least approximately 1940. Land use is not expected to change in the future. The nearest residential population is located within 0.5-mile southwest of the site. No nursing homes, schools, or hospitals are located within 1 mile.

The only documented releases to the environment at the GWCC site are a release of CCA from the former CCA process area (EMCON, 1994) and a release from the former $CuSO_4$ evaporation structure (EMCON, 1990). While minor releases have occurred at the site, primarily during loading and unloading, or during handling of chemicals, these releases have been in areas with secondary containment and are reportedly cleaned up immediately.

4.2 Conclusions

4.2.1 Groundwater

- The crest of the Tualatin Mountains, located west of the site, and the Willamette River, located northeast of the site, are considered hydraulic boundaries.

- The depth to groundwater ranges from approximately 15 to more than 20 feet bgs (EMCON, 1994).

- The site is underlain by dredge spoil sediments overlying native alluvial sediments. The base of the dredge spoil sediments is saturated. The fine-grained nature of the native alluvial sediments restricts vertical migration.

- Groundwater flow varies from northwest to northeast depending on the proximity to the Willamette River. Groundwater discharges to the Willamette River (EMCON, 1994). The volume of groundwater that discharges from the thin layer of saturated dredge spoil sediments to the river is a small fraction of the volume of water that flows past the site.

- The aboveground storage tanks were constructed with and have always had secondary containment structures.

- There is a public water supply that provides potable water to the area.

- There are no domestic groundwater wells or municipal well fields within 1-mile downgradient of the site.

- Groundwater is not used for industrial purposes downgradient of the site. The nearest industrial well is located at the Chevron facility, upgradient of the GWCC site. The status of two wells drilled by the Penn Salt Company in 1949 and 1953 are unknown.

- Terrestrial species (e.g., birds) are not expected to be in direct contact with groundwater because of its depth below the site (i.e., 15 to more than 20 feet).

- Groundwater impacts associated with the CCA release have been assessed. Groundwater monitoring is continuing. Undocumented isolated activities may have resulted in releases (e.g., possible runoff of rinsate water from the drum wash area). However, the groundwater at the site is not expected to adversely impact human health or the environment.

4.2.2 Surface Water

- The Willamette River is not used as a source of potable water downgradient of the GWCC site.

- Surface water runoff (i.e., stormwater) is controlled and monitored according to the requirements of the NPDES permit.

- Groundwater discharging to the Willamette River will be substantially diluted upon interfacing with water from the river. Consequently, aquatic organisms are not expected to be adversely impacted as a result of groundwater discharging to the Willamette River from beneath the GWCC site.

- No endangered, threatened, or species of special concern are known to reside in the area.

4.2.3 Air

- There is no indication that historical spills or releases at the site have, or will, impact air quality.

- Historical spills or releases to soil have been responded to and cleaned up in a timely manner.

- Releases associated with normal operations and procedures (e.g., from valves, gaskets, and pipe fittings) are in areas with secondary containment.

- The soil at the site is covered by asphalt, gravel, and structures (e.g., buildings) which reduce potential dust emissions.

- The wind speed in the area averages approximately 4.4 mph. Any substances released to air would be expected to be rapidly dispersed.

4.2.4 Direct Contact

- The potential for direct contact throughout the site is reduced because the site is covered by asphalt, gravel, concrete, and structures (e.g., buildings).

- Access to the site is controlled by plant security and restricted by a site fence and the Willamette River.

- Spills in the railcar loading and unloading area were responded to and cleaned up in a timely manner.

- Flintkote reportedly placed roofing materials (e.g., asphalt material) into the ground behind the GWCC warehouse and in the drum rinsing area. This area is currently covered by asphalt paving. In addition, the physical/chemical characteristics (e.g., solid at ambient temperature) of asphalt material, preclude its migration in soil or in water.

- Current releases are incidental and localized. They result from normal operations and procedures (e.g., from valves, gaskets, and pipe fittings) and are contained by secondary containment structures. Also, if a release occurs, GWCC responds immediately, containing and cleaning up the spill.

4.3 Recommendations

Based on the information reviewed by EMCON, interviews with current and past employees, a reconnaissance of facility, and a review of exposure pathways at the GWCC facility, EMCON makes the following recommendation:

- Continue to monitor groundwater at the GWCC Technical Center to evaluate the effectiveness of the CCA cleanup.

There appears to be no threat to human health or the environment associated with the GWCC site nor is there any indication that GWCC's activities are impacting off-site properties or the environment. Therefore, no additional assessment, characterization, or remediation is recommended.

LIMITATIONS

The services described in this report were performed consistent with generally accepted professional consulting principles and practices. No other warranty, express or implied, is made. These services were performed consistent with our agreement with our client. This report is solely for the use and information of our client, the client's designated representative, the client's legal counsel, and state and federal regulatory agencies, including the DEQ. Any reliance on this report by a third party, other than those named above, is at such party's sole risk. The report should be reviewed in its entirety.

Opinions and recommendations contained in this report apply to conditions existing when services were performed and are intended only for the client, purposes, locations, time frames, and project parameters indicated. We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services. We do not warrant the accuracy of information supplied by others, nor the use of segregated portions of this report.

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USFWS. 1981. *National Wetlands Inventory Maps Portland, Linnton, and Sauvie Island, Oregon Quadrangles*. U.S. Fish & Wildlife Service, Photograph Base Map, revised 1989.

USGS. 1977. *7.5 Minute Quadrangle, Portland, and Linnton Oregon*. U.S. Geological Survey, Published 1961, photorevised 1970 and 1977.

WSDOT. 1984. *1984 Standard Specifications for Road, Bridge, and Municipal Construction*. Washington State Department of Transportation.

Table 1

McCall Oil & Chemical Corporation
Portland, Oregon
Summary of Information Sources

Aerial Photographs

Northern Light Studio, Portland, Oregon
Photograph OHP 2611E (1956); BRU #146E (1940); P077 11-19E (1977)

U.S. Army Corps of Engineers, Portland District, Portland, Oregon
Photographs #3403 (1971); #39 (1948); 67-953 (1967); 23-5865 (1936); 61-3755 (1961); 76-175 (1976)

Spencer B. Gross, Portland, Oregon
Photographs SBG-Metro-75 #26 (9-18-75); SBG Metro 90 #26-54 (8-4-90); SBG Port-Will 2-10 (8-3-93); SBG-Metro-66 #14-26 (1966); SBG-Metro-80 #26-45 (1980); SBG-Metro-84 #26-45 (1984); SBG-Westside-92 #8-28 (1992)

Consultant Reports

Hart Crowser (January 29, 1993)
SEACOR (Chevron - June 15, 1993)
SEACOR (Union Oil - June 15, 1993)

Fire Department Records

Portland Fire Bureau records:

- Oil burner & liquified petroleum gas (LPG) permits
- Gasoline & motor oil storage tank permits
- Oil and compressed gas storage tank permits
- Abandoned storage tank permits
- Inspection records

Geology Reports

Beeson et al. (1991)

Ground Water Reports

Brown (1963)

Historical Occupant Records

City Directories, Portland, Oregon, 1993, 1985, 1980-81, 1975, 1970, 1965, 1960, 1955, 1943-44, 1935 and 1931

Historical Maps

Sanborn Fire Insurance Maps, 1965, 1955, 1932

Plumbing and Sewer Permits

City of Portland, Bureau of Buildings, plumbing inspection reports and permits

Public Agency Records

City of Portland, plumbing and sewer records

Table 1

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Summary of Information Sources

Regulatory Agency Lists/Files

Oregon DEQ Lists:

- Active permits (January, 1994)
- Confirmed Releases List (December, 1992)
- National Pollution Discharge Elimination System (NPDES) permits
- Resource Conservation and Recovery Act (RCRA) Region 10 Report: Hazardous Waste Generators, Transporters, and Treatment-Storage-Disposal Facilities (March 10, 1993)
- Water Pollution Control Facility (WPCF) permits
- Comprehensive Environmental Response, Compensation, and Liability Information Systems (CERCLIS) EPA Superfund Program List (April, 1993)
- Environmental Site Cleanup List (April, 1993)

Agency Files

Columbia-Willamette Air Pollution Authority files for Pioneer Flintkote Company
DEQ agency files for McCall Oil and Chemical Corporation, Great Western Chemical Company, and Chemax

Corporate Files

McCall Oil and Chemical Corporation
Great Western Chemical Company

Title Records

Multnomah County Assessor, Tax Lot Maps (1993)
County Recorder Records (1940 to present), site history records

Topographic Maps

U.S. Geological Survey (USGS) Portland, and Linnton, Oregon, 7.5-minute quadrangle maps

Transformer Information

Portland General Electric (PGE), PCB test data

Water Rights and Water Wells

Oregon Water Resources Department records

Well Logs and Water Rights

Oregon Department of Water Resources records